McGRAW-HILL HOME ECONOMICS SERIES

ANNIE LOUISE MACLEOD, PH.D., CONSULTING EDITOR

THE FAMILY IN HEALTH AND IN ILLNESS

McGRAW-HILL HOME ECONOMICS SERIES

ANNIE LOUISE MACLEOD, PH. D., *Consulting Editor*

Arlitt · PSYCHOLOGY OF INFANCY AND EARLY CHILDHOOD

Arlitt · FAMILY RELATIONSHIPS

Bailey, Laton, and Bishop · STUDYING CHILDREN IN SCHOOL
WORKBOOK I—*Study of Child in Preschool*
WORKBOOK II—*Study of Child in Elementary School*
WORKBOOK III—*Study of Youth in Secondary School*

Burrell · ORGANIC CHEMISTRY

Hawley · ECONOMICS OF FOOD CONSUMPTION

Macleod and Nason · CHEMISTRY AND COOKERY

Nason · INTRODUCTION TO EXPERIMENTAL COOKERY

Osborn · PHYSICS OF THE HOME

Sherbon · THE CHILD

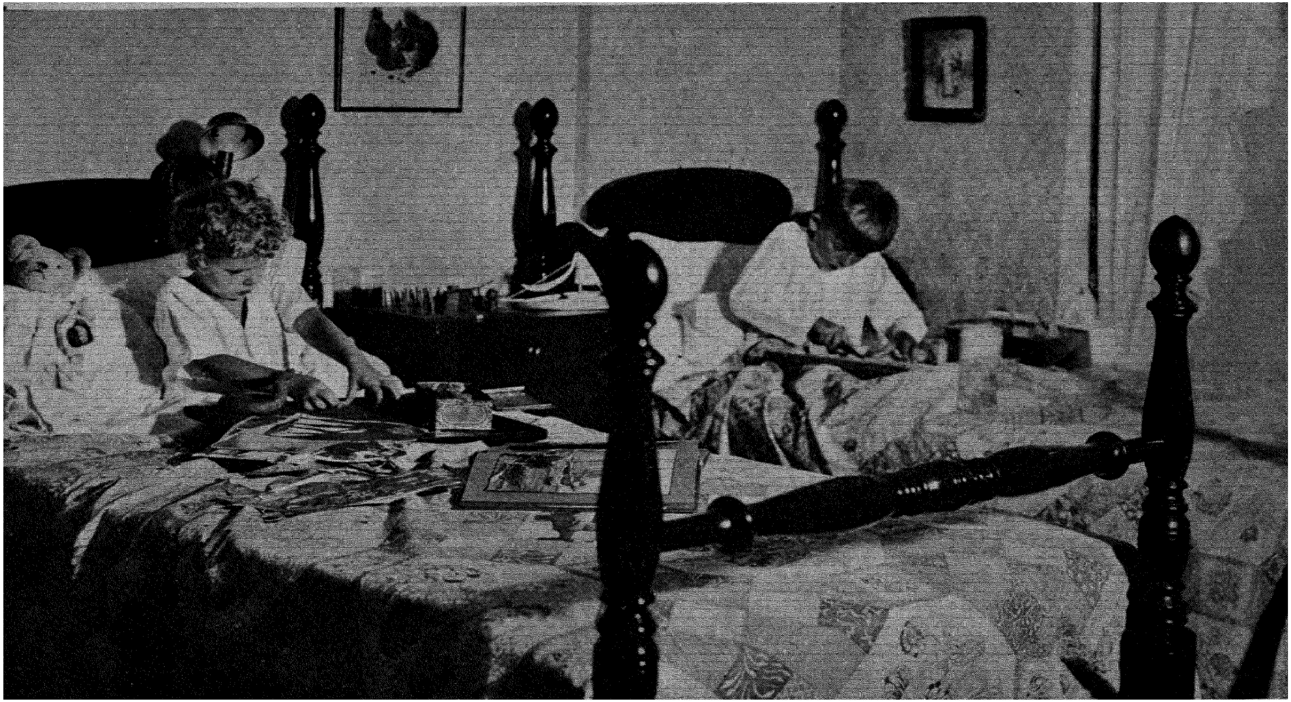
Sherbon · THE FAMILY IN HEALTH AND IN ILLNESS

Wagoner · THE DEVELOPMENT OF LEARNING IN YOUNG CHILDREN

Wagoner · OBSERVATION OF YOUNG CHILDREN

Woodhouse · BUSINESS OPPORTUNITIES FOR THE HOME ECONOMIST

Young · CLOTHING THE CHILD



Staying in bed held no dread for this brother and sister. The ship model and the scrapbook were sick-a-bed projects. *(Frontispiece.)*

THE FAMILY IN HEALTH AND IN ILLNESS

BY

FLORENCE BROWN SHERBON, A.M., M.D.
Professor of Child Development and Health of the Family,
Department of Home Economics, University of Kansas

FIRST EDITION
SIXTH IMPRESSION

McGRAW-HILL BOOK COMPANY, INC.
NEW YORK AND LONDON
1937

PRINTED IN THE UNITED STATES OF AMERICA

THE MAPLE PRESS COMPANY, YORK, PA.

To

ELIZABETH C. SPRAGUE

PREFACE

The purpose of this text is to assist the college woman student to orient herself with reference to the conservation of her own health and that of any family group for whose welfare she may become responsible. The health of any family and the intelligent management of illness in the household depend immediately and directly upon the health consciousness and health intelligence of the homemaker. Recognition of this fact has led to the introduction in most college curricula of courses pertaining to those subjects.

The material here presented represents the content of the author's own lectures given in the Department of Home Economics of the University of Kansas. A course in the science of positive health together with the prevention and practical care of illness must necessarily be an "applied course," borrowing from chemistry, biology, and bacteriology, from home and community hygiene, from nutrition, nursing, and medicine, and even from household management and household engineering the factual information required. Indeed one of the prime functions of applied courses is that of calling the students' attention to the practical relation of general academic subjects to human living.

It is the belief of the author that college women should desire a scientific basis for every subject studied. It is her experience that as a group they respond to scientific presentation with avidity and interest. The more scientific-minded and the better grounded in science the homemaker is, the better understanding she will have of the problems of daily living within the household group, the more dignity and interest will inhere in the monotonous routines of life, and the better prepared will she be both to prevent and to meet emergencies and difficulties. Furthermore the scientific-minded homemaker will be able to act intelligently as to details of conduct and to make her own rules, whereas the woman lacking such an outlook is necessarily dependent upon

specific rules and is too often unable to discriminate between good and poor authority.

The author has tried to include the scientific information necessary to intelligent understanding of the subjects presented, without too much technical detail and with the use of a minimum of technical terms. The homemaker, however, does need to acquire to some extent the language of the sick room and of physical and medical science, that she may be able to read relevant current literature and may understand her physician and cooperate with him intelligently. To this end a glossary of new terms prefaces each technical subject and, where feasible, the first use of new terms is accompanied by a definition or defining synonym.

It is not the author's purpose to produce a textbook on nursing; the more strictly technical aspects of sick-room care could not and should not be covered in a nonprofessional treatise. Only the technics are presented which are requisite if one is to make a sick person comfortable, conserve his strength, feed him intelligently, and perform the simpler, more usual nursing services. Household safety, preparedness, and the handling of emergencies are presented as essentials to the conservation of family health.

The information about diseases may seem to some teachers and students to be unduly detailed and extensive, particularly in view of the fact that new discoveries and new methods of treatment are so constantly replacing the old. The author, however, shares the belief of the public-health profession that the laity, who are the ones who have the diseases, have a right to know what medical science can tell them about the nature of the ailments they wish to avoid.

Another reason, as the author believes, why women citizens should be as fully informed as possible about the common diseases is that they should be equipped to lead and cooperate in public programs of prevention and control.

It is scarcely necessary to add that the teacher of any fluid, changing subject such as those under consideration should constantly scrutinize current literature in the given field in order to correct the material of her courses and keep her teaching up-to-date.

It goes without saying that on any campus where this textbook may be used any units which duplicate work given in other courses should be omitted. The point is that the student should approach the subject of family health with sufficient knowledge of body structure and function and sufficient personal-health orientation to enable her to handle the subjects of disease and care of illness understandingly, and, especially, to enable her to throw all the weight of her influence and intelligence into every phase of health education and disease prevention. Where sufficiently adequate personal-hygiene courses have not preceded this course as a prerequisite, the unit on Positive Health is essential.

FLORENCE BROWN SHERBON.

LAWRENCE, KANSAS,
July, 1937.

ACKNOWLEDGMENTS

The material presented in this book has been accumulating for some seventeen years of classroom work. The identity of many sources has become lost in antiquity, but the author is none the less grateful though she is unable to be specific and personal in expressing appreciation for some of the content.

The creation of the manuscript has been possible, first of all, by reason of the liberal policy of the head of the Department of Home Economics of the University of Kansas, Elizabeth C. Sprague, who has given the author free rein to develop her teaching through continual experiment in matter and method.

The author is specifically indebted to the following persons for criticism and suggestion: to Kathryn Tissue of the Department of Home Economics, for criticism of the chapters on Foods; to Dr. Cora M. Downs of the Department of Bacteriology for reading the chapter on Infection and Immunity; to Dr. Orville Withers of the staff of the Kansas University School of Medicine for material assistance with the chapter on Hypersensitization; to Leon Bauman of the Lawrence City Health Department for reading the chapter on Public Health and the Family; to Dr. Ralph Canuteson of the Student Health Service of the University of Kansas for reading much of the manuscript; to Dr. R. W. Robb of the staff of the Kansas State Hospital at Osawatomie, for assistance with the chapters on The Nervous System and on Mental Deficiency and Mental Derangement; to Rosemond Losh, chairman, Home Safety Division of the National Safety Council, for reading the chapter on Safety; to Dr. Margaret Dale of Kansas City, for the criticism of chapters on The Endocrine System and The Reproductive System. The author is under deep obligation to Dr. Josephine Burnham of the Department of English for both editorial and factual criticism.

Acknowledgment for assistance in the preparation of the manuscript should be extended to L. M. Peace and Oren Bingham for

photography; to Margaret Roberts, Carrol Johnson, Alice Sherbon, Dorothy Boyle, and Mrs. Maye Leonard for drawings; to Marie Forbes, Dorothy Boyle, Margaret Messenheimer, Mildred Messenheimer, and the first-aid crew who so obligingly posed for the many photographs; to David and Bettina Gagliardo and their gracious mother the author is indebted for the charming frontispiece and for Figs. 19, 107, 119, 120; and to various other personal friends for incidental photographs.

The author desires especially to mention the efficient secretarial service of Margaret Messenheimer, which has extended throughout the entire period of production.

Thanks and appreciation are due to the many publishers and to private, state, and federal agencies who have permitted the use of illustrations and quotations. The editors of *Hygeia* have generously permitted the author to reproduce in Chapters 36 and 37 portions of articles formerly appearing in the magazine.

Finally, the author wishes to salute the succession of fine young American women who have so cheerfully provided the experimental material for the accompanying treatise.

FLORENCE BROWN SHERBON.

LAWRENCE, KANSAS,
July, 1937.

CONTENTS

UNIT 1

POSITIVE HEALTH

UNIT II

THE COMMON DISEASES

UNIT I
POSITIVE HEALTH

CHAPTER I

THE STUDENT MEMBER OF THE FAMILY

Since this is a college text designed to help the young woman student prepare herself for the responsibilities of family and, incidentally, community life, the first subject considered is that of the orientation of the student herself in college life. Before she can intelligently discuss the factors of physical and mental health in the family she must adjust her own scheme of living on a rational and efficient basis. The subjects presented in this chapter pertain to the successful orientation of any new student in any college. Some of the phases of daily living presented may seem at first thought not to be strictly related to personal or family health. It is the belief of the author, however, that harmonious adjustment of the life of the individual is basic to complete and optimal health; and that the homely, prosaic matters of order and efficiency may be highly important to the conservation of effort and to satisfaction in living. Moreover, the student will carry over into the organization and management of her home, when the time comes, the methods and practices which have prevailed in her previous adult life. Therefore, no apology is made for asking students to give sober thought to the satisfactory organization of their present personal lives.

Finding a Place to Live.—When the young adult leaves home and enters for the first time upon the complete management of her own affairs it is very important that adequate attention should be given to the conservation of health. Unless fate determines that she live in a dormitory or other organized house, one of the first unavoidable decisions, and one which may have lasting effect upon health, efficiency, and happiness, relates to the selection of a room.

No matter what is the size of her budget, or the degree of simplicity or elaborateness of living entailed by her economic status, certain items are so essential that the student should look specifically for them in deciding upon a room.

General Cleanliness.—Do the conditions of the house and premises and the personal appearance of the landlady give promise of clean and sanitary surroundings?

The Room.—Does it admit sufficient sunlight? Is it reasonably quiet and private? Are the floor, rugs, mattress, blankets, and pillows clean? How often is the bed linen changed? What limitations are there upon the towel supply?

The Bathroom.—Note the cleanliness of tub, toilet, and lavatory. Are there any restrictions upon the use of hot water?

The Lighting.—How many fixtures are there, and how are they placed? Is it possible to have a proper amount of light, favorably placed for night work?

Heating.—Will the room be warm for night work, and reasonably cool in hot weather?

Minimum Essentials.—No matter how small the budget, a young woman owes it to her health, self-respect, and efficiency so to situate herself that she may take a daily bath—at least she should have privacy for taking sponge baths—and it should be possible to have a reasonable amount of hot water daily. Proper and adequate sleep is impossible unless one has a clean and comfortable bed. Efficient mental work is difficult without a comfortable chair, a properly placed light, and a convenient work-table. The student should be able to control the temperature of the room while working. A room may present a superficially attractive appearance and still lack essentials.

Attractiveness in color and furnishing is desirable. However, any room which is clean, orderly, and convenient is in some measure attractive and can be made to show the personality of the occupant in details of decoration and arrangement. It is rarely necessary to accept a downright shabby room because of the necessity of low rent. A bare, painted floor is preferable to a worn, faded, and dusty rug. Broken furniture can be mended and painted. Faded, torn, and dirty wall paper should lead to the rejection of a room.

The Student's Part.—Having insisted upon the very reasonable and essential details stated, the student should remember that the owner of the room, in turn, has a right to expect and require of her certain standards of behavior and cooperation.

Care of Personal Belongings.—Nothing more quickly and accurately reveals the personal standard of refinement and training than does the care of personal clothing, toilet equipment, papers, books, mail, etc. No human being should be expected to handle the personal clothing and belongings of another. If a student scatters shoes, stockings, or underwear about the room or drops them upon the floor of the closet they should lie untouched and the room and floor go uncleaned until she has made adequate care possible. The same rule should hold with reference to the tops of study table, dresser, or bookshelves.

Bathroom Etiquette.—The most scrupulous landlady in the world cannot police a bathroom used by an entire household to the extent of cleaning tub and bowl after each using. It becomes a matter of common courtesy and decency to leave a clean lavatory bowl and clean tub for the next user. Just as no one has a right to expect another to pick up her shoes or put her comb and brush where they belong, so no one has a right to force another to clean a tub or bowl which she has used.

Quiet Behavior.—Another test of breeding is consideration for others in the matter of unnecessary noise. To run noisily up and down stairs, slam doors, or carry on boisterous conversation, particularly late at night, is to betray crude standards and a rudeness and inconsiderateness quite inexcusable in any candidate for scholastic attainment or scholastic culture.

Care of Equipment and Supplies.—The really polite and cultured person will take the same care of supplies and equipment belonging to another as she would those in her own home. She will not waste soap or hot water or use towels to remove lipstick or face cream, and she will not deface furniture with spilled lotions, scratches, or cigarette burns.

Selecting a Roommate.—Having determined upon a room in which it is possible to live in an orderly, comfortable, and efficient manner, and having assumed her share of responsibility for maintaining a proper *status quo*, the student may find it necessary to seek a roommate. While this bond is not so irrevocable as marriage, one should seek much the same factors as those which make for happy and enduring marital life!

This will mean such a degree of equality in culture and tastes that the two will enjoy going about together and will want, on

the whole, to participate in similar amusements and outside activities. There should be agreement as to living habits—temperature of room, rising and retiring time, ventilation, division of work, etc. Willingness to adjust to each other is the prime requisite. The individual who does not know how to adjust pleasantly to other personalities should never undertake to live with others in any relationship.

The Physical and Mental Appraisal.—In most colleges both physical and mental examinations are required on entrance. On the basis of the physical record the student, with the assistance of the medical examiner, should draft her program of work, recreation, and exercise. If she is handicapped in any way by remediable defects of body metabolism or body structure her first endeavor should be to remove the handicap. She can no more turn out a good quality of scholastic work with a bodily machine that is not in working order than she could turn out a neat manuscript on a typewriter having screws loose, oil gummed, and type unaligned and full of dust. The entrance examinations are in the nature of an overhauling of machinery before entering upon an endurance run. It is the student's own fault if she does not profit by them and put herself into the best possible physical condition.

It is not customary to give out intelligence ratings, and the significance and value of the ordinary tests are now somewhat under fire, but any student can rate herself roughly on a basis of what she could and could not answer in the tests and her own estimate of her strong and weak points. If she has reason to feel dissatisfied with the result she may do well to confer with her official adviser, with the college dean or the social adviser, or with some member of the Department of Psychology. It sometimes happens that a little wise direction at this time saves a student from attempting to do too much, or attempting subjects unsuited to her particular temperament and ability, and prevents unnecessary bewilderment and discouragement. The early establishment of a relationship of confidence and understanding between the student and her teachers enriches the entire college life.

The Daily Schedule.—Having become somewhat oriented and having enrolled for the selected subject matter, the student should

proceed to budget both her money and her time. Of the two, budgeting time may be the more difficult and the more important to individual success. She should rule a sheet of paper for 7 days of 24 hours each, covering the 168 hours of the week (see Appendix). Then she should impose upon this, under appropriate headings, the class schedule and all fixed appointments and dates. She should next determine upon health essentials and write these into the form. These will include *regular and sufficient amount of sleep*. How many hours she should have in order to keep in optimal condition will be for her to determine individually. She and her roommate should agree upon this point if possible. If one of the pair requires less sleep than the other she should be extremely considerate about disturbing the rest of her partner.

One should crave *regular and sufficient outdoor exercise* as one craves food. Indeed it is practically impossible to maintain a healthy appetite and enjoyment of food and tranquil nerves without a definite amount of activity in the open air. Changing classes furnishes a small but important quantity, since it occurs regularly. Walking to and from school furnishes a highly variable amount of exercise. In addition to this, however, every student should regularly indulge in some outdoor sport for sheer fun—something for every season—swimming, tennis, boating, hockey, skating, and, always, hiking. The habit of living a certain part of one's daily life in the open is absolutely fundamental to the highest physical and mental accomplishment and to the development and maintenance of a happy, optimistic temperament at any age, and the habit now established should persist throughout life. Incidentally, habits of physical activity are the best safeguard against a thickened figure and general breakdown in middle age.

The third item to be spread with care upon this form is *the necessary preparation of school work*. No student should take more work than she can do in a reasonable number of hours of daily preparation. By determining in the beginning the average time which should be given to each subject the student avoids the strain of falling behind and floundering and bringing herself up at the end with heroic effort, loss of sleep and worry, or the grief of finding recovery impossible.

The daily routine care of the person, such as dressing, toilet, care of clothing, time spent at meals, should be reduced to the simplest terms of efficiency. Wherever two moments can be reduced to one, time is saved for constructive accomplishment. This especially applies to putting things in their proper places instead of dropping wraps and books to be picked up later, not to mention time wasted in hunting for misplaced articles; to developing technic for doing the hair quickly and so that it will "stay," a technic for taking a bath quickly, caring for towels, and scrubbing the tub with the fewest possible movements. It even applies to the routine of caring for the teeth and nails.

Our student should next decide upon the particular *organized activities* she will incorporate in her scheme of living: church; professional or study group activity; sorority or other social group. The time these require must be carefully budgeted, including time consumed in going and coming, committee work, etc.

Cultural and purely recreational experiences must have their share of time if our student is to lead a satisfying life. She must find time to attend good movies, theaters, concerts, art exhibits; time for reading some good fiction and poetry; time to attend specific college functions such as football games, dances, and parties.

Last and too often least comes *some time for rest and meditation,* some intervals in which to think things over with relaxed body and mind; to let life fall into shape and assume proper values. Even five minutes thus spent is well worth while and gives one a fresh start. College life is so full of demands that only the most expert management and budgeting of time make it possible to meet them all.

It is suggested that the student, whenever she becomes confused and begins to slip in her work, make a blank form for each of seven days and put down for each day exactly how she actually spends her time. By comparing this with her ideal or pattern budget she will be able to correct the worst of her defects.

Food and Nutrition.—The intelligent daily management of one's dietary is one of the most important responsibilities of the individual who would feel well, look well, and accomplish much. In Chap. VII will be found statements of the essentials of body

chemistry and the dietetic principles necessary to maintaining the complicated living chemical machine in health and efficiency. *Selecting an eating place* is one of the items of induction into school life which should receive careful attention. Nutritionists now believe that a daily quotient of both raw and cooked highly pigmented vegetables and fruits is essential to health and vigor, and also a daily quotient of protein having high biological value, such as milk, eggs, and meat. The student should have the habit of eating and liking such foods and should refuse to eat at a table unduly featuring meat, starch, and pastry. She had far better do her own planning and cooking if she is unable to secure properly balanced and properly prepared food within her budget limit.

Technic of Study.—Studying is a matter of brain-cell activity. The cortical cells of the cerebrum, or thinking part of the brain, receive certain impressions by way of the eyes directed upon the printed page or from other sensory sources of information. The wise seeker after knowledge will make it physiologically as easy as possible for these cortical cells to function. This means that the student will set her stage for mechanical efficiency by arranging paper, sharpened pencils, a filled pen, blotter, etc., upon her study table. She will arrange the light so that her brain will not be distracted by the discomfort of eyestrain (Fig. 31). She will seat herself comfortably in such a position that the blood supply to her brain will not be impaired by pressure from the muscles at the back of the neck. She should use a book rest or copy holder which will bring her work within easy range of vision. It is a serious mistake to sit by the hour with hanging head, narrow, contracted chest, and bowed back. The wise student will change position, rotate head and shoulders, lean backward and take a few deep breaths at regular intervals during an evening of continuous study.

Incidentally, attention should be called to the fact that continuous mental effort diverts blood to the brain. A student often finishes an evening of intensive study with hot head and cold feet. It is a good plan to drink hot milk or other warm beverage and take a hot foot bath or warm the feet thoroughly with some means of artificial heat before going to bed. One will fall asleep more readily and sleep more profoundly because of these precautions.

Grades.—As long as "grades" are held as an ever-present threat over the student it is difficult to think in terms of subject values. If the young student, however, can only start out by realizing that the surest way to make good grades is to cultivate an interest in the subject which will lead her to want to find out about it, she will soon develop technics of study which will insure good grades. In other words, the best way to make good grades is to forget grades!

The Attack.—In entering upon a course in an unknown subject the attack is all-important. Since the mind seems to grasp "wholes" before it can intelligently comprehend the parts of the whole, the student should first try to get a perspective, or bird's-eye view of the subject. The objective and the philosophy of the course are usually stated concisely in the preface and introduction. It is always worth while to read such preliminary statements. It is also worth while hastily to skim through the text, trying to get a mental picture of the skeleton or structural outline which is to be followed. Each day's details will then fit into an understandable whole. There must be a constant effort to see the relationships of details.

The student who reads the first paragraph or page or chapter with the determination to master it, and who looks up every unfamiliar word, reads references, and, especially, thinks intensively about it, is laying the foundation for increasing enjoyment and understanding of all the subject. Everything following after will be easier because of the hard work done upon the first page and chapter. *A student who refuses to pass over a paragraph or a page she does not understand is certain, not only of high grades, but of the joy of accomplishment, which is one of the most satisfying emotions of life.*

Words.—The real secret of efficiency in study and of "acquiring an education" is in mastering words. One thinks in words: scholastic attainment of every sort is a matter of mastering words, of making words carry constantly fuller, wider, richer, meanings, of learning new words and becoming able to think with them. The first book the new student should lay upon her study table is a good dictionary, and she should wear it out before she ends her college career! The real student will rejoice in the acquisition of a new technical vocabulary in each subject she studies. Making

a glossary of new words should be a matter of routine with every course.

Meaning.—Having mastered the words and forced each one to become an organic entity, the student must next search for the pattern, unity, or meaning contained within the particular ensemble of words found in a paragraph or chapter. The student who makes good grades is the one who searches for meaning rather than the one who strives to fill her memory by (often) fruitless repetition. When one understands a subject she cannot forget it. Until she understands it she cannot remember it except in a parrotlike repetition, which invariably betrays her actual ignorance.

Examinations should be occasions for the pulling together and complete organization of subject matter. The student who studies as here suggested, and who has not left air holes in her thinking, will not need to subject herself to periods of frantic strain and worry in preparation for the ordeal of showing the powers-that-be how much she knows.

In any event and under all circumstances, one presents what she does know most advantageously when her brain is fresh and rested. Many more students fail because their brains are fogged and clouded with the toxins of fatigue, artificial stimulation, and worry, than because of intrinsic lack of information. Of all times the student should be most scrupulous as to food, elimination, and sleep before an important examination. One does not start on a hard auto journey with carbon on the spark plugs, dirty oil in the cylinders, and the gas tank half empty!

The Scale of Values.—As one matures, her experiences and her thinking and reasoning about her experiences tend to assume, many times unconsciously, patterns of thought and feeling which constitute her personal code. One shapes her conduct according to this code whether she is aware of it or not. Actually this is her total character pattern—her personality.

At the time of starting on a new phase of one's career, and one which involves increased personal responsibility, it is a good plan to think somewhat intensively about a personal scale of values. What are the ruling motives of your life? *Is it material success:* making and spending money; becoming able to "have things"? *Is it social success:* achieving popularity with the selected group

one most admires; social leadership? *Is it scholastic or professional success:* making high grades; making the honor roll; achieving a reputation for being "smart" or superior intellectually? *Is it creative success:* satisfying an inner urge to achieve some determined goal in literature, art, or science, social service, or business, for the pure satisfaction of achievement? To what extent are you willing to sacrifice remuneration or recognition in order to accomplish a creative achievement? *Is it service to others:* a consuming desire to make others in general, or some particular class, more comfortable, better, or happier? Might this include a normal desire for marriage and children? *Is it finding some one to lean upon:* seeking a socially and financially advantageous marriage; an easy, lucrative job? Are you consciously or unconsciously covering up your faults and striving to create a better impression than you deserve? Is this the way to achieve enduring, long-time happiness?

Having made an effort "to stand off and look at herself," the student should consciously crystallize an attitude toward life expressing her personal philosophy—an attitude ruling out self-pity and envy, an attitude which will set her feet upon a path of deeply satisfying accomplishment and bring a serenity sufficient to carry her over the daily frets and frictions of life.

The forming of friendships is one of the most important things in college life. The surest way to approximate one's personal ideal is to seek association with the sort of people one admires. But do not stand off and waste time and energy thinking, "I wish I could be like so-and-so." You cannot successfully imitate anyone, but you can be yourself in the sense of developing your own natural characteristics to the fullest extent. Especially, cultivate the fine art of friendliness and of liking other people no matter how different they may be from you. Above all cultivate the art of tolerance for all sorts and conditions, ages, and circumstances. Do not permit yourself to dislike anyone no matter how much you may actively disapprove of his conduct. Try to understand the forces which have caused the action and try not to sit in judgment. One important thing you can do, no matter how you feel, and that is never permit yourself to say caustic or critical things about individuals. Disapproval of conduct and judicial discussion of the implications of antisocial behavior can

be expressed impersonally. One good rule is not to say anything about a person you would be unwilling or embarrassed to say to him. To stop and think "what if she should hear me; how would I feel?" is a pretty good test of one's fairness and honesty in social relationships.

References

BENNETT, MARGARET ELAINE: *College and Life*, McGraw-Hill Book Company, Inc., 1933.

BILHUBER and POST: *Health Facts for College Women*, A. S. Barnes & Company, 1928.

DIEHL, HAROLD S.: *Healthful Living*, McGraw-Hill Book Company, Inc., 1935.

ETHRIDGE, MAUDE LEE: *Health Facts for College Students*, W. B. Saunders Company, 1933.

LAIRD, DONALD B.: *Personal Efficiency*, Harper & Brothers, 1925.

MORGAN, JOHN J. B.: *Keeping a Sound Mind*, The Macmillan Company, 1934.

THOM, D. A.: *Normal Youth and Its Everyday Problems*, D. Appleton-Century Company, Inc., 1932.

THURSTON and THURSTON: *Personality Schedule*, University of Chicago Press, 1929.

WOOTTEN, KATHLEEN W.: *A Health Workbook for College Freshmen*, A. S. Barnes & Company, 1934.

CHAPTER II

WHEN THE STUDENT MEMBER ESTABLISHES A HOME

The health of the family depends directly upon the personal health and health knowledge of the heads of the family, upon their foresight and intelligence in establishing their home, and upon their practical efficiency in rearing their children.

The basic principles of personal health will be discussed here. The various aspects of childbearing and child rearing can be covered adequately only in a separate course or in a separate treatise. There are many books and pamphlets dealing with these subjects, ranging from the very simple to the exhaustively scientific. A few such titles are appended at the end of the present chapter. This chapter deals with certain matters of practical efficiency in establishing and maintaining a home which are basic to the health of the family group. For the thesis of this book it is assumed that there are, or are to be, children. The first thing, then, will be to find a place in which to live satisfactorily and in which to rear a family.

Selecting a Home.—We shall imagine a young couple starting out with the figures of a modest income in mind. They will logically first decide upon the "part of town" they prefer to live in. They may fix upon this by eliminating those sections within which they are unwilling to dwell. They will of course want to live in a "respectable" neighborhood, where they will at least be free from annoyance, and, if possible, where they may find congenial neighbors. It is to be hoped that they will be willing to reside among simple folk of incomes similar to their own, or that at any rate they will not hazard the strain and temptation of living in a district of much higher financial rating than theirs.

While the distance from work and the character and cost of transportation must be considered, there are many advantages in living "out on the edge," especially for children. Space, quiet,

cleanliness, and natural beauty are frequently available at low cost if the young homemakers are willing to pioneer a bit. They must find a place which is free from health hazards, where good water and milk are available, where satisfactory sewage disposal is possible, where there is good drainage, freedom from sanitary nuisances such as breed flies or mosquitoes, and freedom from industrial smokes or offensive odors.

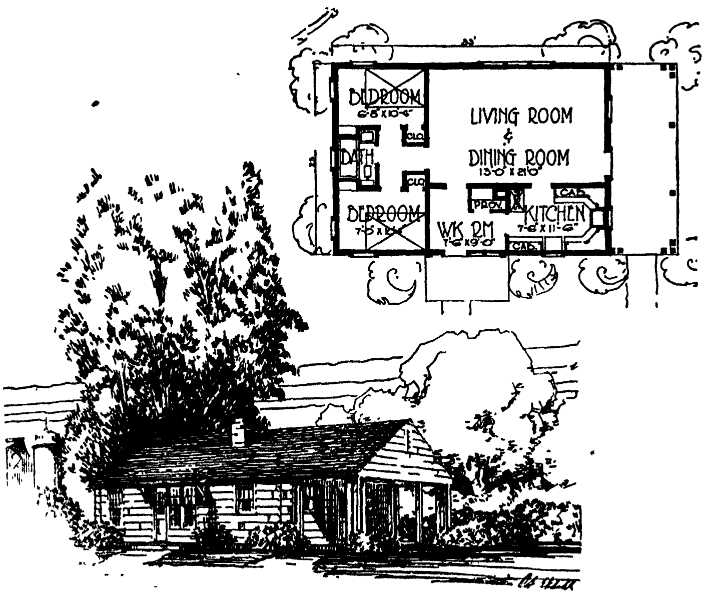


FIG 1.—"A little home on the edge of things." The rent of an apartment will pay for this. (*Farmhouse Plans, U. S. Department of Agriculture, Wichers & Ekdahl, Architects.*)

Having found the general region of choice they will look for a house and not an apartment (see Fig. 1). There must be space, outside and in, which belongs to the children and within which they may develop in freedom. Outside the house there should be something to cast a shade, a tree if possible, if within the range of choice, a tree that may be climbed! There must be space for outdoor play, a place to dig and plant and build.

The house itself may be small or large, old or new, conventional or modern. We hope it may have artistically valid lines, but

much can be done with vines and planting, and appearance may have to be a secondary issue.

Within the house the young couple must first inspect the building for sanitation and secondly for space and convenience. All plumbing must be rigidly inspected; basement and foundations must be watertight and rodent-tight. The structure and finish must be sufficiently intact to make the house, at least with fresh paint and paper, vermin-free. The provisions for heating and ventilation must be satisfactory.

There should be space for individual privacy for every member of the family, if possible; lacking this the pair should set apart some place which can belong to each child and in which the child may be let alone. Children require relief from the pressures, psychic and physical, which obtain in all groups that must be thrown together within small spaces. It must be remembered that growing things do not stand crowding.

The convenience of the homemaker should be considered, and the inside of the house should be arranged and the furniture placed to save steps and energy. The homemaker's reading shelf should contain a standard text or recent bulletin on home furnishing and administration, one on home architecture and plumbing, one on food and cookery, and one on common illness and emergencies.

The Administration of the Home.—The home must be administered for health and joy. This means that the domestic machinery must be so well adjusted that there is little creaking. The heads of the family, first of all, must agree or compromise upon all issues of importance. They must, together, set up a time frame, a daily and weekly schedule, which will provide for health and efficiency, and they must both support and safeguard this as the basis of orderly life in the home. This schedule must provide daily for regular rising, regular meals, regular sleep. The mother's part is to have the meals on time, the father's part is to come to meals on time. This may seem to be an unimportant item, but the disregard of this one thing has furnished the entering rift of discord and the basis of nutritional upset in many new homes. A regular sleep schedule is fundamental and not always easily maintained. The provider commonly puts in a full day's work and in his own best interest should have regular sleep. The

mother finds it possible to get in extra rest while the children nap; she is keenly aware of social obligations, and it not infrequently happens that she overpersuades the tired business or professional man to dress and go out for social occasions which leave him more or less physically and nervously unfit the next day. If this is repeated, the effect becomes cumulative until, in far too many cases, a fine young chap takes to stimulants and becomes so toxic with fatigue and narcotics that his whole personality alters, or he may go on to a definite breakdown, and always his professional or creative work suffers. All of this interferes with the personal understanding and loyalty between the married partners. A sufficient and regular amount of sleep must go down in the time frame and each must safeguard and value it for the other. Also, within the week's schedule extra things like recreation, organized interests, special care of the home plant, etc., must be included.

The time frame should provide for such distribution of each member's service and time that the health and comfort of all are assured. Then the members of the family should let each other alone. There should be no fussing, faultfinding, or coercion. They should live together "but not too near together." There must be freedom for each to live his own life, after there has been a proved and tried integration of effort such that each one contributes his just share to the common weal.

The Periodical Health Examination.—The infant should be weighed and measured and seen by a health specialist (physician, nutritionist, or nurse) once each week for the first year; once each month throughout the growing or school years; and once each year for the rest of his life. This plan is now accepted by all medical, health, and education authorities as the best safeguard of health and the best known prevention of disease or illness. The adult members of the family should have a medical health examination once each year from an examiner who will check health habits and give positive advice as to how to maintain optimal health. Several large life insurance companies provide such examinations for their policyholders. The statistics of such companies show that they save money in the long run because their examinees live longer than do similar control groups.

The successful rearing of a healthy family is one of life's triumphant experiences, but one requiring the same sort of study

and understanding and single-minded effort as that required by any other major business or professional enterprise. The important thing is that the young couple shall realize from the start that they are partners in a big business, that of human husbandry.

References

DENNIS, LEMO T.: *Living Together in the Family*, American Home Economics Association, 1934.

GILBRETH, LILLIAN: *The Homemaker and Her Job*, D. Appleton-Century Company, Inc., 1927.

———: *Living Together with Our Children*, W. W. Norton & Company, Inc., 1926.

———: *Homemaking as a Center of Research*, Columbia University Press, 1927.

JUSTIN and RUST: *Home Living*, J. B. Lippincott Company, 1935.

WHITMAN, R. B.: *First Aid to the Ailing House*, McGraw-Hill Book Company, Inc., 1934.

WOOD, LINDQUIST, and STUDLEY: *Managing the Home*, Houghton Mifflin Company, 1932.

Pamphlets on Health Examination and Disease Prevention, The Life Extension Institute, 25 West 43d St., New York.

Pamphlets on Health Examination and Disease Prevention and Many Positive Health Subjects, Metropolitan Life Insurance Company, Welfare Division, 1 Madison Ave., New York.

Pamphlets on Health Examination and Disease Prevention, U. S. Public Health Service, Washington, D. C.

References on Child Care and Development

FAEGRE and ANDERSON: *Child Care and Training*, 4th ed., University of Minnesota Press, 1937.

RAND, SWEENEY, and VINCENT: *Growth and Development of the Young Child*, W. B. Saunders Co., 1934.

SHERBON, FLORENCE BROWN: *The Child, His Origin, Development and Care*, McGraw-Hill Book Company, Inc., 1934.

U. S. Department of Labor, Children's Bureau, Washington, D. C.: Bulletins on *Prenatal Care; Infant Care; The Child from One to Six.*

ZABRISKIE, LOUISE: *Mother and Baby Care in Pictures*, J. B. Lippincott Company, 1935.

CHAPTER III

WHAT IS HEALTH?

Having surveyed the conditions of successful college life and the establishment of a satisfactory home, we next consider the personal health of the members of the family. As a point of departure it will be necessary to define health as the term will be used in this book.

Few words are subject to greater variety and range of definitions than the word health. To some it means mere absence of incapacitating physical illness. Another will say that health must include body and mind, and that there shall be no defect or abnormality in either. To still another the idea of the optimal or the best will appeal, and such a one will say that the really healthy individual must show in all the parts and functions of his body-mind complex the very highest degree of vigor and excellence compatible with his inherited capacity.

If we agree that the latter concept is the one which we wish to accept as an ideal the next step will be to consider the essential organic and functional character of the human body and the care and management necessary to maintain it in an optimal condition.

The modern sciences of psychology, education, physiology, and medicine unite in regarding the human being as an integrated biochemical organism with behavior of every sort (physical, mental, and emotional) as the function of the total living chemical mechanism, with the cell as its unit of structure and organization. Health, then, becomes primarily and fundamentally a matter of maintaining correct chemical reaction in each and every one of the millions of related body cells and, especially, in maintaining the relationships which make of every organism an individual and a unity. It becomes impossible to consider the basic factors of health in terms other than those of chemistry, or in terms other than those of relationship or organization. We should bear in mind that it is the pattern of organization, as well as its units of structure, which determines its character or individuality.

Living matter, as we know it, is literally the earth become alive. Protoplasm, the stuff of life of which all cells are made, is made up from some 17 or 18 elements of the earth (see page 65) which have become integrated and arranged in the precise and complicated ways presented in cell structure, and activated, or set going (probably) by the potent unseen rays of sunlight known as ultra-violet rays. The continuation of life is dependent upon constant replacement of these elements in the proportions which preserve the unity of the organism. Human food must contain the chemical elements mentioned as entering into the composition of the body and in such form that they may be transformed into the specific cell structures of bone, brain, gland, and muscle. The matter of scientific food selection becomes that of securing foods in which these 18 elements exist in usable form and proper proportion. Foreign chemical substances coming in contact with external or internal surfaces of the body, and not transformed into cell structure, are received by the body with tolerance or resentment or surrender according to circumstances.

The study of the human body together with its function and behavior becomes, actually, in large part a study of the devices of nature for maintaining the subtle chemical balances and relationships among and within the body cells. Thus mechanically we find that the body is essentially a watertight sac of skin and mucous membrane within which is found a complicated arrangement of cell systems, all composed chiefly of sea water. This sea water (normal salt or physiological salt solution) is contained in part in the microscopic colloidal cell units; in part, it circulates as the basis of blood and lymph and other body fluids (see page 103). Dissolved in this "living water" are found, in limitless combinations and concentrations, the other elements listed on page 65 as entering into the composition of the body. In one colloidal cell system, the thyroid, will be found concentration of colloidal iodine; within certain cells of the liver, glycogen; within cells of bone and teeth a great concentration of calcium, etc. Claude Bernard, a noted early physiologist, said, "All the vital mechanisms, however varied they may be, have only one object, that of preserving constant the conditions of life in the internal environment."[1]

[1] CANNON, W. B., *The Wisdom of the Body*, p. 38, W. W. Norton & Company, Inc., 1932.

Colloids.—The term colloid refers to a form which may, under certain conditions, be assumed by any element or compound of elements whereby the component units of structure cohere so firmly that masses or micellae are formed, too large to pass through animal membrane such as capillary walls. These micellae, in turn, cohere in a form of matter which is ductile or gluelike, and which may be drawn out or spread out in exceedingly thin threads or membranes. Protoplasm is colloidal, and a tissue cell, under the microscope, exhibits a spongy or a reticular or a bubblelike arrangement of its particular colloidal protoplasm such that an incredible amount of surface is exposed to contact with the cell water ("bound water" or "living water") within which the delicate and complicated and specific chemical reactions take place which are characteristic of each and every living cell. It is this clever mechanical arrangement which makes

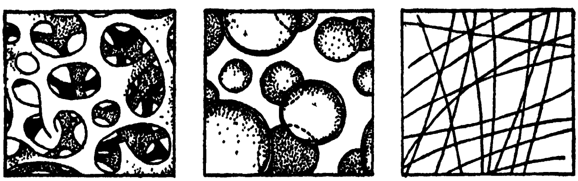


FIG. 2.—Various arrangements of protoplasmic colloids.

possible the rapid and complicated chemical activities of life (see Fig. 2).

The cell is the unit of vital chemical action, and the protein nucleus of the cell is the cell engine which selects from the blood stream, by virtue of the enzymelike action of its protein genes (see page 26), the specific chemicals it requires to lay down calcium, if it is a bone cell, to manufacture milk, if it is a cell in the mammary gland, or burn the sugar stored in its surrounding cytoplasm if it is a muscle or nerve cell and must release a special brand of force or energy. When the favored 18 of the elements of the earth first became organized in the primeval ooze, or became alive, the organism doubtless presented the general structure shown in Fig. 3(1). Every living organism from that day to this starts as a single cell with the simple structure indicated. The human body represents merely a colony of one-

celled organisms bound together, so to speak, by hereditary laws of physiological dependence and evolutionary integration. According to modern organismic science all phenomena are units in a gigantic cosmic "whole" or unity.

Therefore given a body which is an efficient biochemical machine, and having established relationships with environment

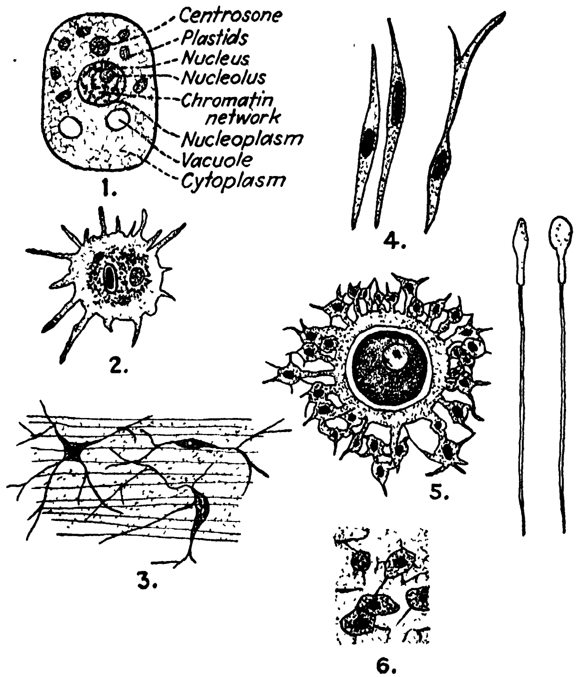


FIG. 3.—Various forms of cells. (1) Diagram of a typical cell. (2) An ameba. (3) Nerve cells among the muscle fibers in hydra. (4) Unstriated muscle cells. (5) Human ovum and sperm. (6) Cartilage cells.

in the way of food, air, etc., which will enable that body to maintain this optimal chemical condition, the human being interacts with environment, both material and social, in innumerable and complex ways, some of which have been indicated in the discussion of the orientation of the student and the establishment of a home. In the larger sense health involves not alone a chemically efficient body but socially efficient relationships with other human biochemical organisms. In other words, the human being is a

unity within himself, and he is also a unit within a complexly integrated organization of human beings known as society. So intimate is this integration that his social experiences may definitely affect his body chemistry. Indeed the cell system we call the brain, and certain of the endocrine glands, seem to have been provided with chemical mechanisms specifically sensitive to social experiences.

Health, then, may be defined as that development and condition of the body, and that relationship with and attitude toward his physical and social environment, which will enable the individual to function at his highest potential level, physically, creatively, and socially, and which will insure to him the greatest possible accomplishment in the way of that service to the world which in itself brings the deepest satisfactions of life.

References

CANNON, W. B.: *The Wisdom of the Body*, W. W. Norton & Company, Inc., 1932.

HUSSEY, MARGUERITE M.: Chap. IX, "Health as the Integration of the Living Mechanism," pp. 109–111, in *Mind-Body Relationships*, Jay Nash, Editor, A. S. Barnes & Company, 1931.

STEIGLITZ, JULIUS: Chap. I, "The Significance of Chemistry," *Chemistry in Medicine*, The Chemical Foundation, Inc., 1928

WILLIAMS, JESSIE FEIRING: *Personal Hygiene Applied*, 3d ed., p. 18, W. B. Saunders Company, 1928.

New Terms in Chap. IV

Chromosomes. Small, densely staining protein bodies which form in the nucleus of a cell when it is about to divide.

Congenital. Applied to any trait, such as a defect, present at birth; sometimes applied to defects acquired during prenatal life as distinguished from strictly hereditary traits.

Dominant. Applies to the one of the pair of traits received from paternal and maternal ancestry which appears in the offspring.

Enzyme. An organic chemical compound which causes specific chemical action but remains unchanged itself.

Genes. Minute chemical units making up chromosomes. Genes are believed to convey traits and determine the specificity of the cell.

Germ plasm. A general term applied to the hereditary substance which passes from one generation to another.

Ovary. The glandular organ containing the female reproductive cells or ova.

Ovum. The egg, or female reproductive cell.

Phylogenetic. Pertaining to the evolutionary history of a race, species, or individual.

Recessive. Applies to the one of the pair of traits received from paternal and maternal ancestry which does not appear in the offspring.

Sperm. The male reproductive cell, also called spermatozoon.

Testicle. The glandular organ containing the male reproductive cells or sperm.

CHAPTER IV

THE HEREDITARY PATTERN

This is not only one man, this is the father of those who shall be fathers in their turns,
In him the start of populous states and rich republics,
Of him countless immortal lives with countless embodiments and enjoyments.
How do you know who shall come from the offspring of his offspring through the centuries?
(Who might you find you have come from yourself, if you could trace back through the centuries?)[1]

WALT WHITMAN

Every man of us has all the centuries in him.

VISCOUNT MORLEY

What the individual becomes is necessarily limited and conditioned by the composite pattern of inheritance which has come to him from a long line of ancestors. The mechanism through which his traits came was the particular cell of germ plasm which resulted from the union of a sperm and an ovum within his mother's body. Originally within this sperm and this ovum, while they were developing in the testes and ovaries, there were double sets of trait determiners or genes, making a quadruple supply. Nature cleverly reduces this number by having all germ cells undergo reduction division, or maturation, prior to their union. When the male and female cells finally unite they produce a new cell with double instead of quadruple sets of genes or trait determiners. This means that all potential traits are paired, one coming from the male, the other from the female. Only one trait of a given sort can appear. The one which does appear is called dominant; the veiled trait is said to be recessive. If one parent was purebred for brown eyes and the other purebred for blue eyes, the brown eyes will be dominant and the child will have brown eyes. He may have genes for blue eyes, how-

[1] WHITMAN, WALT, "I Sing the Body Electric," *Leaves of Grass*, Doubleday, Doran & Company, Inc.

ever, as a recessive trait, and may, himself, have a blue-eyed child.

The trait determiners are minute protein chemical units of enzymelike character, called genes, which are contained within

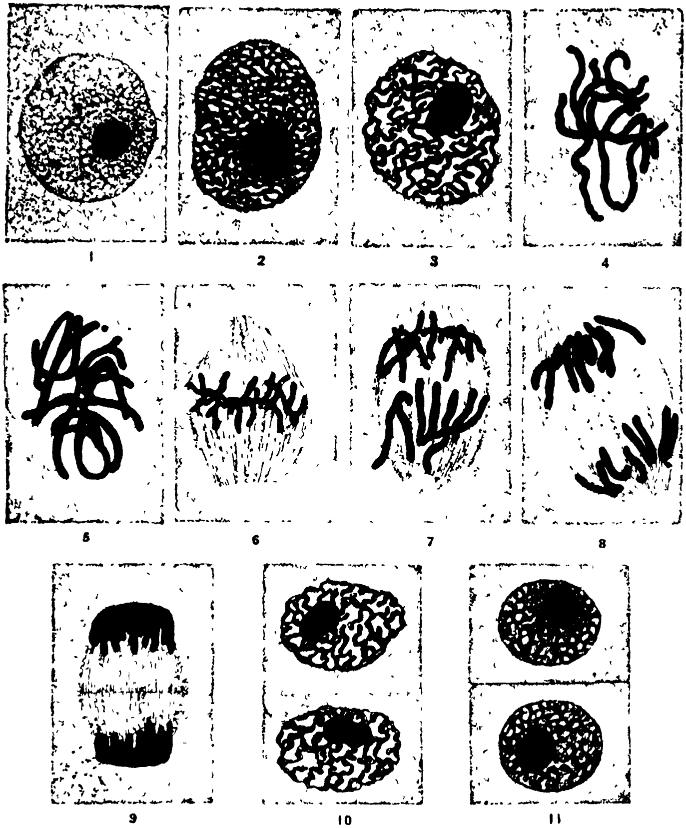


FIG. 4 A cell from the growing tip of an onion root undergoing division or mitosis. (2, 3, 4, 5) Chromosomes forming. (6, 7, 8, 9) Pairing and splitting of chromosomes. (10, 11) Formation of two new cells exactly alike. (*Elwyn, Yourself Incorporated, Coward-McCann, Inc.*)

the nucleus of the cell. Usually the genes are distributed unevenly throughout the nucleus within the chromatin or staining substance. When a cell is about to function in repair, in fertilization, or in growth, this chromatin substance arranges itself in a definite number of paired masses called chromosomes (see Fig. 4).

The genes are arranged in linear series or chains within each chromosome, the arrangement being the same within each of any pair of chromosomes. The chromosome containing the genes for brown eyes from the father (we shall say) is matched by the chromosome from the mother, containing in the corresponding

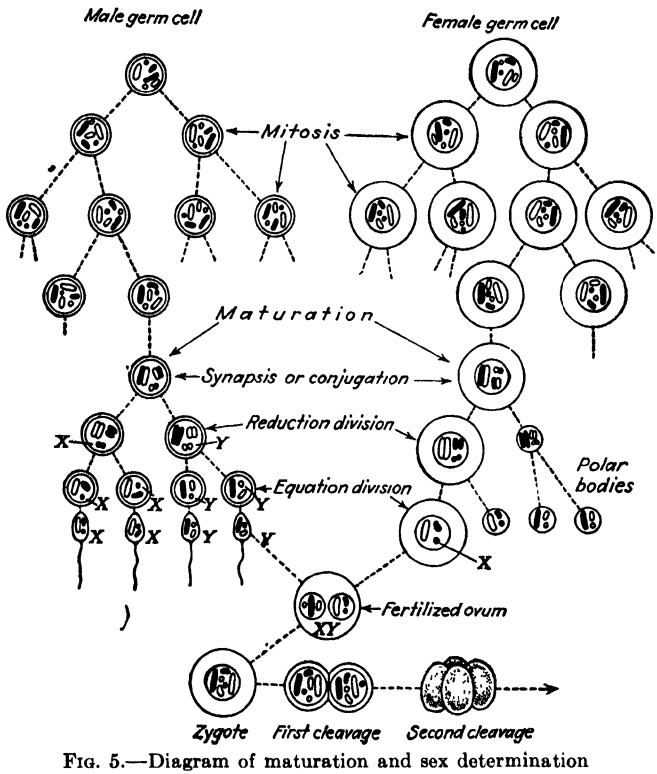


FIG. 5.—Diagram of maturation and sex determination

spot of the paired chromosome genes for blue eyes. As has been said, in such a case the child of the union will have brown eyes.

We may suppose that one chromosome from the ovum (or from the mother's side) contains genes for a certain type of defective hearing; if the corresponding genes in the chromosome contributed by the father are normal and dominant the child will have normal hearing but may convey genes for defective hearing to his children.

Half of all male germ cells contain determiners for maleness (or rather "absence of femaleness") in a so-called *Y* chromosome. Half of them contain determiners for femaleness within a so-called *X* chromosome (see Fig. 5). The law of chance thus brings it about that, in the long run, exactly an equal number of male and female children are conceived, although at one time more male children may survive to living birth, and at another time there may be a somewhat greater number of female births reported.

While it is true that some persons are limited in their potential development by defective or deficient genes in the germ plasm from which they come, the great majority of individuals possess many more potential traits and capacities than any environment will ever bring to expression. After nature makes a structure, such as an arm or an association center in the brain, ready to begin to function, it depends entirely upon environment (experience) what particular kind or degree of activity or skill or development is attained by that arm or brain. An individual may be born with defects or structural limitations, such as clubfeet, color blindness, or lack of tone or rhythm sense; on the other hand many a child has capacity for the fine color and tone discrimination of an artist whose environment never brings it out.

It is now believed that criminals are made, not born, and that defective environment is responsible for the appearance of most of the diseases formerly considered to be inherited. One inherits a combination of traits resultive in low immunity to respiratory diseases. He may never discover this unless his body metabolism and resistance become impaired through prolonged fatigue, worry, or deficient diet. One may inherit a recessive predisposition to cancer of the skin. If he never has any prolonged irritation of the skin such as frequent sunburn, chemical irritant, or friction of clothing, he never will develop cancer of the skin (see page 253).

Most defects present at birth (congenital) are acquired during prenatal life and will not be passed on by the defective person to his children. Birth marks, clubfeet, syphilis, etc., are acquired in intrauterine life. There are certain structural peculiarities which do seem to be hereditary, such as absence of two middle upper incisor teeth, an extra thumb, or webbed toes.

In general one should try to learn all he can about his own inheritance, and all families should keep family trait histories.[1] This is the only way in which the exact truth about particular phases of human heredity can become known; and it is the only way in which the individual can become informed and warned as to lurking potentialities or predispositions in his heredity.

In general, also, no one should worry unduly about the possibility of inheriting mental or physical defects or disease. There are very few inherited susceptibilities which may not be prevented from actually materializing if one pursues a normal program and develops his good traits symmetrically and consistently.

Biological or Phylogenetic Inheritance.—The human body has a long ancestry reaching, in the case of every living human being, back to the first life that ever quivered in the warm deeps of the ancient sea. Something in the essential nature of life force has caused it to assume ever-increasing complexity of organization. The name given to this tendency by science is evolution. The survival of both old and new forms has depended upon their ability to adapt themselves to environment. The human body today is a mass of adaptations to environment: devices for the utilization of other plant and animal organisms as food; mechanisms for enabling the body to withstand extremes of temperature; immunizing defenses against disease, etc. The body, in its development, rehearses to an extent the essential phases of animal evolution. All living things begin as single cells, and in their embryonic stages come a shorter or greater distance along a common path (see Fig. 6). This does not mean that man was once a monkey, but rather that monkeys branched off from the common trunk while man continued to develop into what is, for the present, the top of the evolutionary tree. It will be necessary to keep this interesting fact in mind in considering the functions of the human body as discussed in the chapters which are to follow.

From this slowly unrolling scroll we see brief pictures of the appearance of those structures that go to make up man's body as we know it.

[1] Forms for making family trait records may be secured from:
The Eugenic Record Office, Cold Spring Harbor, Long Island, New York.
The American Eugenic Society, 50 West 50th St., New York.
The Race Betterment Foundation, Battle Creek, Mich.

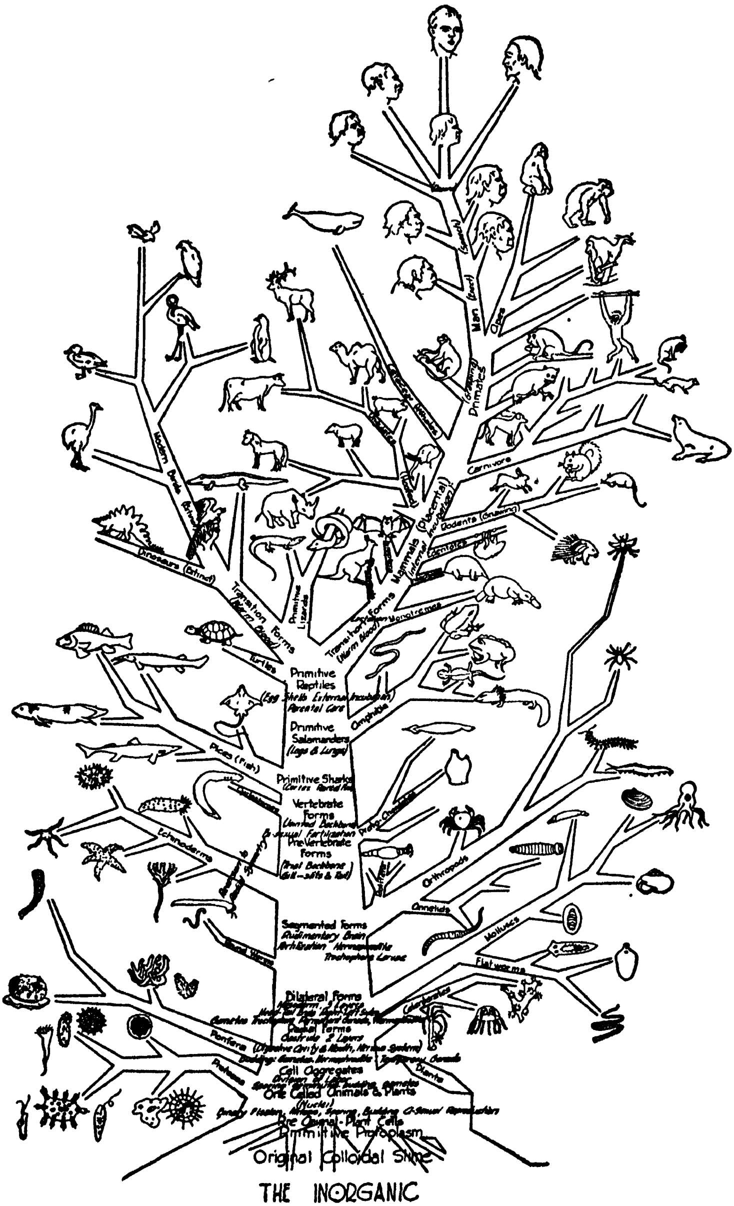


FIG. 6.—The tree of animal evolution (Maud A. Brown)

There have been very many changes in this long procession of animal forms. Body parts and body forms have appeared in great profusion. Many have been used for a while in certain animals, and then, after these animals were no longer dominant, that particular modification in form and habit has disappeared. Again, certain body forms and animal types have been the dominating type for a geologic period, only to be replaced in the next by another form, as the reptilian type was relegated to the background by the succeeding mammalian type. Yet each successive type seems to have contributed something to the mammalian body type shown in man.[1]

References

CANNON, W. B.: *The Wisdom of the Body*, W. W. Norton & Company, Inc., 1932.

CHAMBERS, ROBERT: Chap. VII, "The Body as a Bio-chemical Mechanism: Is It?" in *Mind-Body Relationships*, Jay Nash, Editor, A. S. Barnes & Company, 1931.

DAVENPORT, C. B.: *How We Came by Our Bodies*, Henry Holt & Company, 1936.

EAST, E. M.: *Heredity in Human Affairs*, Charles Scribner's Sons, 1927.

ELWYN, ADOLPH: *Yourself Incorporated*, Coward McCann, Inc., 1930.

HURST, C. C.: *Heredity and the Ascent of Man*, The Macmillan Company, 1935.

HUSSEY, MARGUERITE M.: Chap. IX, "Health as the Integration of the Living Mechanism," in *Mind-Body Relationships*, Jay Nash, Editor, A. S. Barnes & Company, 1931.

JENNINGS, H. S.: *The Biological Basis of Human Nature*, W. W. Norton Company, 1930.

LANE, H. H.: *Animal Biology*, P. Blakiston's Son & Company, 1930.

POPENOE, PAUL: *The Child's Heredity*, Williams & Wilkins Company, 1929.

STEIGLITZ, JULIUS: *Chemistry in Medicine*, The Chemical Foundation, Inc., 1928.

WILLIAMS, JESSIE FIERING: *Personal Hygiene Applied*, 3d ed., W. B. Saunders Company, 1928.

[1] CALDWELL, SKINNER, and TIETZ, *Biological Foundations of Education*, p. 22, Ginn & Company, 1931.

CHAPTER V

THE SKELETAL AND MUSCULAR SYSTEMS

> Perfect alignment of the spine and the major nerve centers with the head and neck are absolutely requisite for efficient brain service. Equipoise of body with the development of will power and clear thinking are as essential to mental progress as a healthy brain and nervous system are to perfect kinesthetic control.[1]

As we proceed with the consideration of individual and family health, we shall try to carry along the concept of the human body as a behaving biochemical organism made up of certain elements of the earth which have, by virtue of their dynamic organization, ascended the scale of evolutionary adjustment to environment from ameba to man. In proceeding from simple to complex the living organism has become a living machine, which employs, in its structure and function, every principle known to chemical and physical science. We cannot consider intelligently the behavior of the body in health and in illness, conserve it in health and care for it in illness, without first understanding at least the basic facts and principles underlying its structure and operation. The various systems of the body will be briefly reviewed, keeping in mind the fact that the parts of the living machine are so closely integrated that no organ or system can operate completely without the cooperation of all the others. The ensuing presentation is designed to give a bird's-eye picture and afford a review of the body mechanism which will vivify the various practical discussions.

The skeletal system supports and gives form to the chemical organs or viscera contained within the skin sac. It protects delicate and important structures within the skull, the pelvis, and the thorax (see Fig. 7), and the blood-forming organs within the bones (see Fig. 8). It provides attachment for muscles by means of the long bones of the legs and arms, the flat bones of the

[1] WILLIAMS, MAUD SMITH, *Growing Straight*, Introduction, A. S. Barnes & Company, 1930.

head, shoulders, and hips. It provides complex movement together with strength and elasticity by means of the arrangement of the vertebrae, the wrists and ankles, and the ribs. It makes upright posture with balance possible by means of the

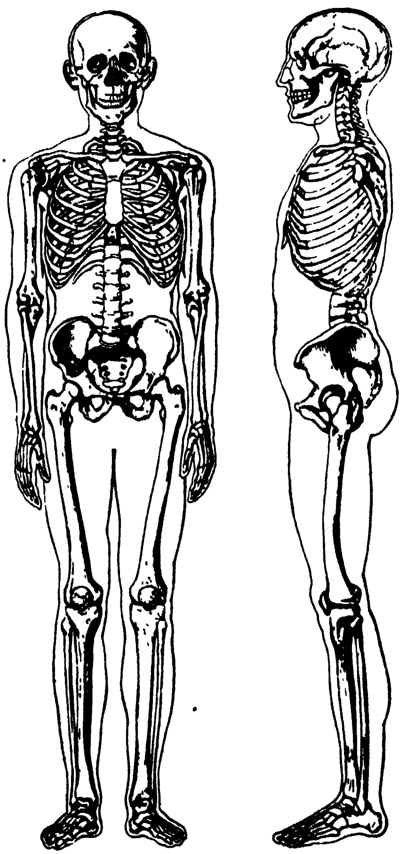


FIG. 7.—The human skeleton. (*Toldt, Atlas of Human Anatomy, The Macmillan Company.*)

peculiar structure of the knee and hip joints, which open in opposite counterbalancing directions, and by the highly specialized mechanisms of the foot (the arches and the anterior spread of the foot) which take the place of the front leg and foot in the four-footed animal.

The skeletal muscles furnish the power in moving bone levers (see Fig. 9), with joints for fulcrums; muscles form anchors and move special organs such as the eye and the tongue; form a retaining and protecting wall for vital organs such as the diaphragm, the abdominal wall, and the perineal floor of the vagina.

The Mechanics of the Body.—The upright position is unique with man. It is difficult to assume, and its maintenance con-

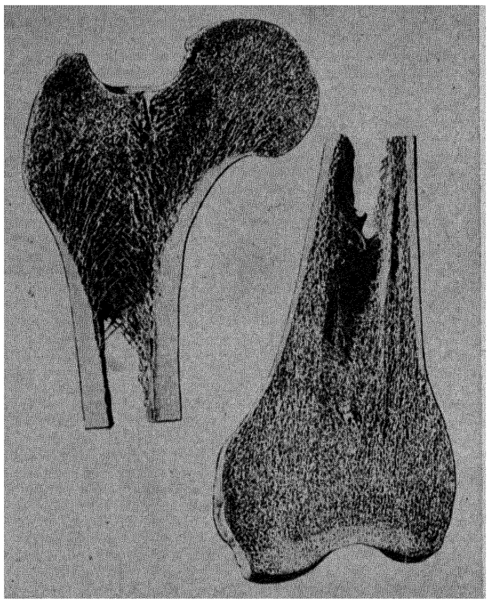


Fig. 8 Cross section of a long bone showing the spaces within which the red blood cells are formed. (*Toldt, Atlas of Human Anatomy, The Macmillan Company.*)

stitutes a perpetual feat of balancing. Correct body mechanics involve muscle pull so equalized that the body is in a state of as nearly absolute balance as possible. This minimizes muscle strain and places the vital organs in favorable relationships for their functioning. The center of gravity in standing should fall just in front of the ankle, a position which releases the strain on the elastic structure of the arch and distributes the weight support over a relatively broad area, letting it fall rather evenly on the pads of the heel, the great toe, and the pad at the base of the little

toe (Fig. 28). The line of correct posture, in most individuals, falls straight from the lobe of the ear, through the tip of the shoulder, through the hip joint, and passes just behind the patella to a point in front of the ankle (Fig. 10).

Faulty Body Mechanics.—The posture line may be broken by dropping the head forward in the characteristic student's reading

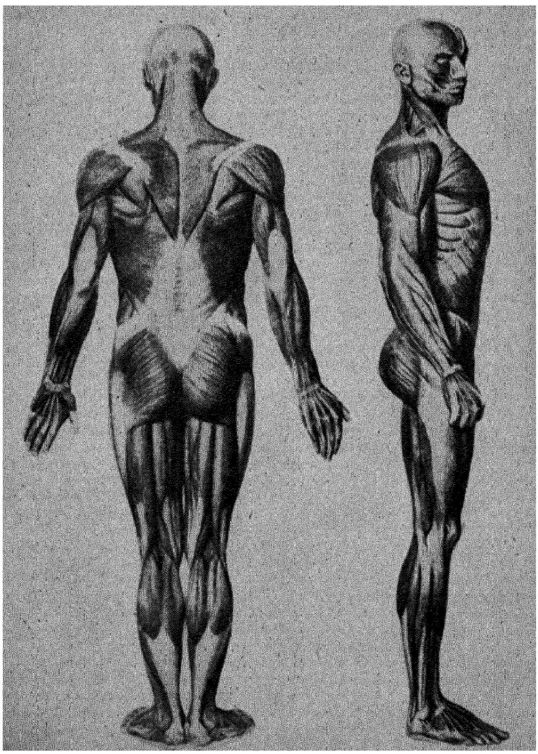
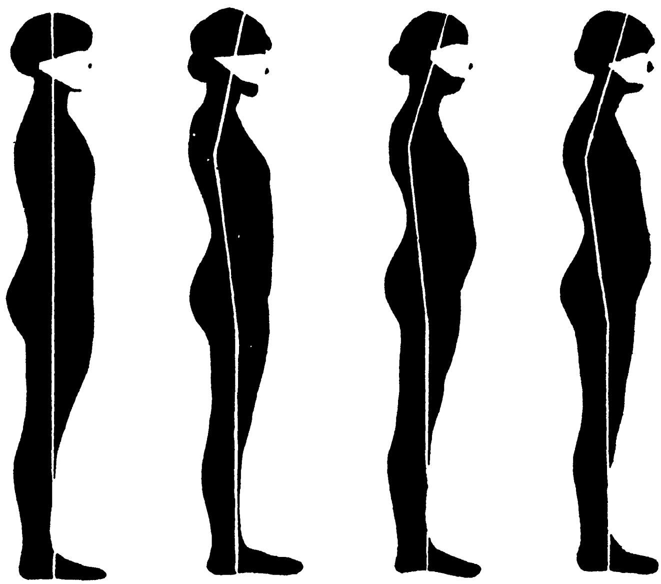


Fig. 9.—The muscular system. (*Tandler, Anatomy, Julius Springer.*)

posture; letting the shoulders slump forward and allowing the scapulae to tip, thus forcing the abdomen to protrude; raising the posterior part of the foot on high heels, which will throw the entire skeletal structure out of adjustment (Fig. 29).

The Effects of Bad Posture. Muscle Strain.—When one segment of the posture line is displaced there must be a compensating

displacement of all the other segments in order to maintain balance (Fig. 10). This displacement throws more or less excessive and unnecessary strain upon many skeletal muscles of the body. The result is general fatigue and impairment of the individual's capacity for continuous standing and walking.



GOOD
1. Straight line from ear through shoulder, hip, and instep.
2. Chest high.
3. Abdomen flat.
4. Back curves normal
5. Weight over arches of feet.

FAIR
1. Head Slightly forward.
2. Chest flat, shoulders slightly drooping.
3. Abdomen slightly protruding.
4. Back curve too great at waist line.

POOR
1. Head forward.
2. Chest flat, shoulders drooping.
3. Abdomen decidedly protruding.
4. Extreme curve in back at waist line (Hollow back).

VERY POOR
1. Head drooping.
2. Chest flat, shoulders rounded and drooping.
3. Abdomen very protuberant.
4. Extreme hollow back.
5. Weight or heels.

FIG. 10.—The posture lines of college women. (*The Department of Physical Education, University of Southern California.*)

INTERFERENCE WITH ORGANIC FUNCTION.—The lung capacity is restricted because the elevation of the ribs in breathing is seriously limited by slumping of the shoulders as in the "debutante slouch" and in the usual position of the body in studying. The free action of the diaphragm may also be restricted by the falling

together of the ribs. Such a condition seriously limits the activity and endurance of the individual, and may predispose to tuberculosis and other respiratory troubles because the residual air in the top of the lungs remains quiescent too long. The free functioning of the abdominal organs may be impaired because of the ptosis (falling) and displacement of the stomach, liver, and bowels by habitual faulty posture. Such restriction of function may be a factor in indigestion and constipation. The pelvic organs may suffer from chronic congestion and crowding due to incorrect posture (Fig. 11), which may cause painful menstruation and predispose to inflammatory conditions and to complications in childbirth[1] (see page 157).

Faulty posture in the young child, in addition to the effects noted above, is especially likely to produce permanent changes in the shape of bones and in the relation and position of soft structures. Spinal curvatures easily occur in the schoolchild from poor sitting posture. The hip axis becomes twisted, producing the familiar "hip twist," with one hip and the opposite shoulder high. This may come from standing on one foot or from carrying one-sided loads (Fig. 12). The pelvis of the growing girl may become so flattened or distorted that complications in childbirth may occur later.

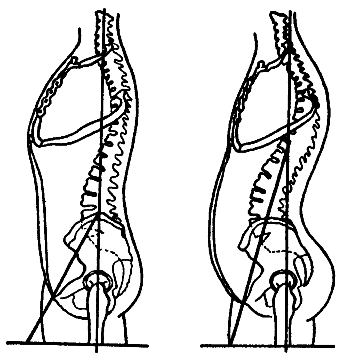


FIG. 11.—Pelvic obliquity. *A*, correct. *B*, incorrect. (*Stafford, Preventive and Corrective Physical Education*, *A. S. Barnes & Company*.)

The Causes of Bad Posture.—Bad skeletal alignment may appear or begin in infancy and may be due to improperly adjusted pillows in bed or buggy; to improperly constructed walkers, jumpers, and go-carts (Fig. 13); to strapping the child in a sitting position for long intervals; to early rickets; continual crouching over playthings on the floor because there is no chair and play

[1] MILLER, NORMAN F., "Posture Studies in Gynecology," *Journal of the American Medical Association*, Nov. 19, 1927 (illustrated with silhouettographs).

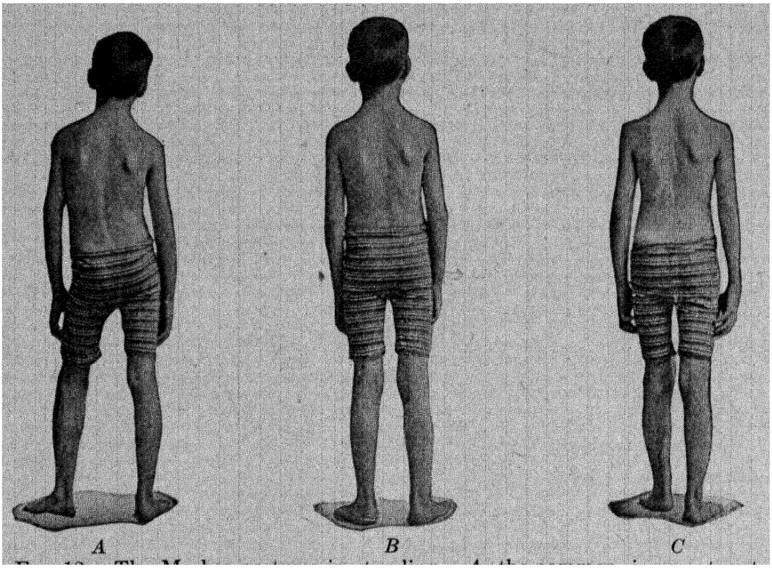


FIG. 12.—The Mosher postures in standing. *A*, the common, incorrect rest posture, *B*, correct standing posture. *C*, rest posture with leg extended. (*McKenzie's Exercise in Education and Medicine, courtesy of W. B. Saunders Company.*)

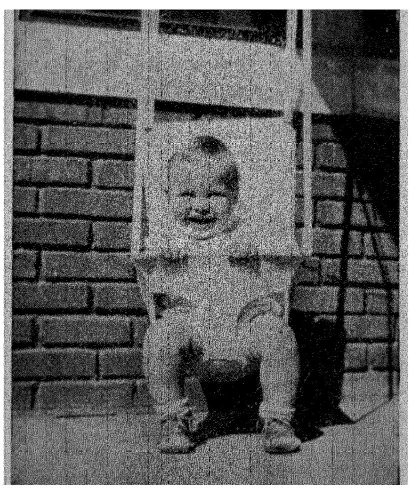


FIG. 13.—Jumpers distort posture.

table adapted to the child's size. Improper support of stockings may be a factor; the commercial underwaist which mothers commonly buy is so constructed that the pull of the stocking supporter comes on the very unstable outward angle of the shoulder. This tips the shoulder blade and narrows the chest (Fig. 14). The too prevalent lack of activities designed to

FIG. 14.—Wrong type of stocking supporter.

develop back, chest, and upper-arm muscles is seen in the case of apartment-living children and in many others.

Bad posture in the young girl may be due to lack of general physical development; malnutrition; fatigue (Fig. 15); occupations involving the lifting and carrying of heavy weights, such as schoolbooks or a heavy baby; ironing, or washing dishes at a high table, or a table too low (Figs. 16 and 17); improperly adjusted seats at school; careless habits of sitting, walking, and standing; improperly adjusted corsets, skirts, stocking supporters, high-heeled shoes.

Bad posture in the boy may be due to poorly fitted clothing such as suspenders, coat necks, belts. Or it may result from one-

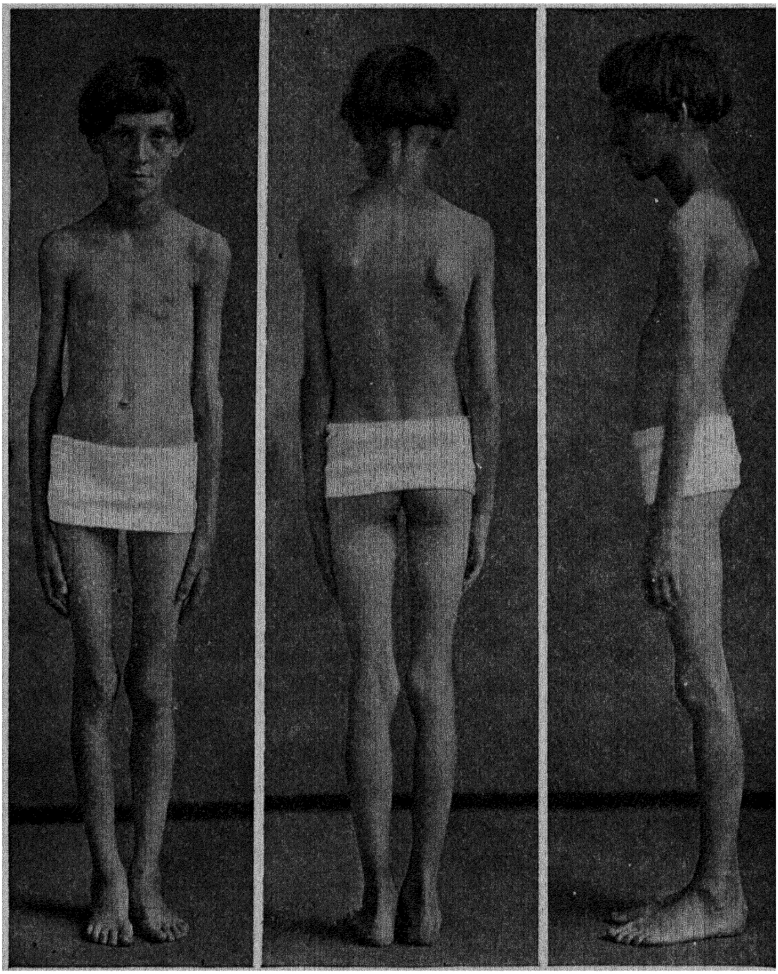


FIG 15—Elsie is a tired child. (*Max and Grete Seham, The Tired Child, J. B. Lippincott Company.*)

sided games, such as right-handed ball, or swimming with a one-sided stroke only; lack of special exercises and sports to compensate for the constant forward pull of most occupations;

improperly adjusted school desks; carelessness in sitting, standing, and walking.

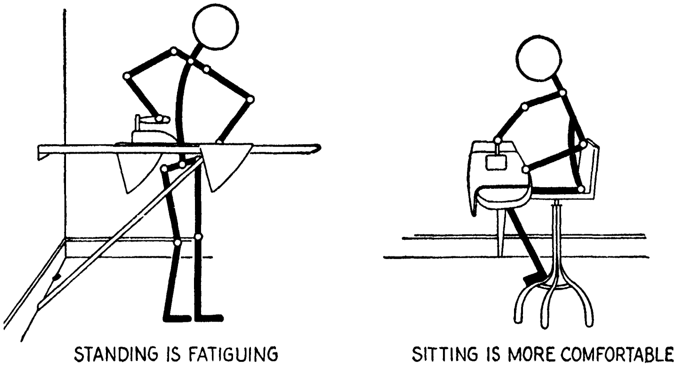


FIG. 16.—Posture for ironing. (*Bulletin on Posture, Office of Cooperative Extension Work, U. S. Department of Agriculture. From Hausarbeit Licht Gemacht, by G. Villwock, published by The Federal German Board of Efficiency, Berlin.*)

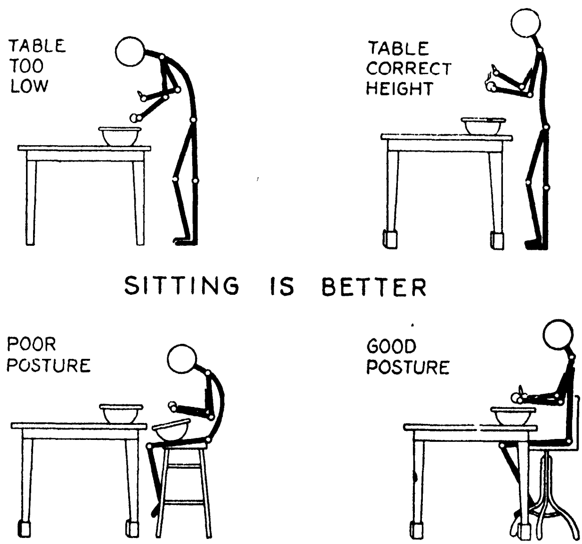


FIG. 17.—Posture when preparing vegetables. (*Bulletin of the Office of Cooperative Extension Work, U. S. Department of Agriculture. From Hausarbeit Licht Gemacht, by G. Villwock, published by the Federal German Board of Efficiency, Berlin.*)

Poor posture in the adult may be due to habitual working postures necessitating a constant forward pull, as in sewing, cooking,

and many other household duties (Figs. 16, 17); to desk work, and various industrial occupations; to clothing which pulls and drags, especially badly adjusted corsets, skirts, and stockings; to high-heeled shoes; to careless sitting posture, especially sitting in chairs which distort the body. In men, one-handed occupations and the forward pull of desk work are the leading factors. The heavy abdomen of middle age always breaks the posture line.

The Hygiene of Posture. *In Infancy.*—Perfect freedom from birth is necessary in order that the child may develop his body

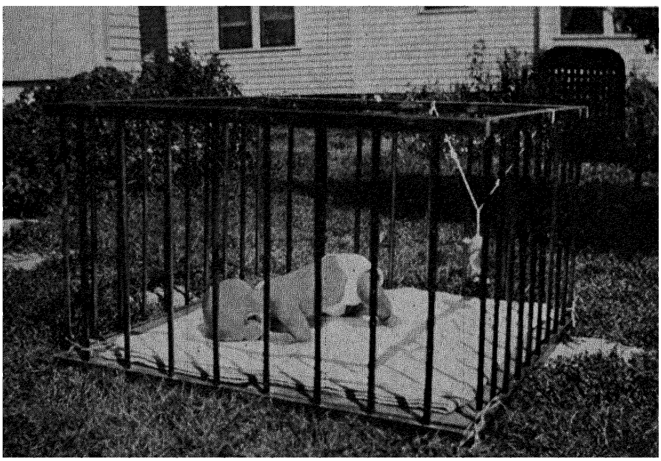


FIG. 18.—There should be free use of the play pen. This five-months-old child is preparing himself for locomotion.

symmetrically and evenly. Let there be careful adjustment of clothing to avoid any restriction; firm mattress and small pillow, or better still, no pillow; let the baby use the play pen freely instead of sitting in buggy or lying in bed (Fig. 18). There should be perfect spontaneity in walking and climbing. There should be no urging and no avoidable restriction. If the child creeps on all fours before walking, so much the better, as this sets back the shoulders and develops the torso.

The Toddler and the Young Child.—The toddler needs freedom to climb, suspending his weight from his hands and otherwise strengthening and equalizing his physical development. He should have equipment for climbing and swinging (Figs. 19–21).

If the family does not possess the traditional tree and haymow, the growing young children, both boys and girls, should be

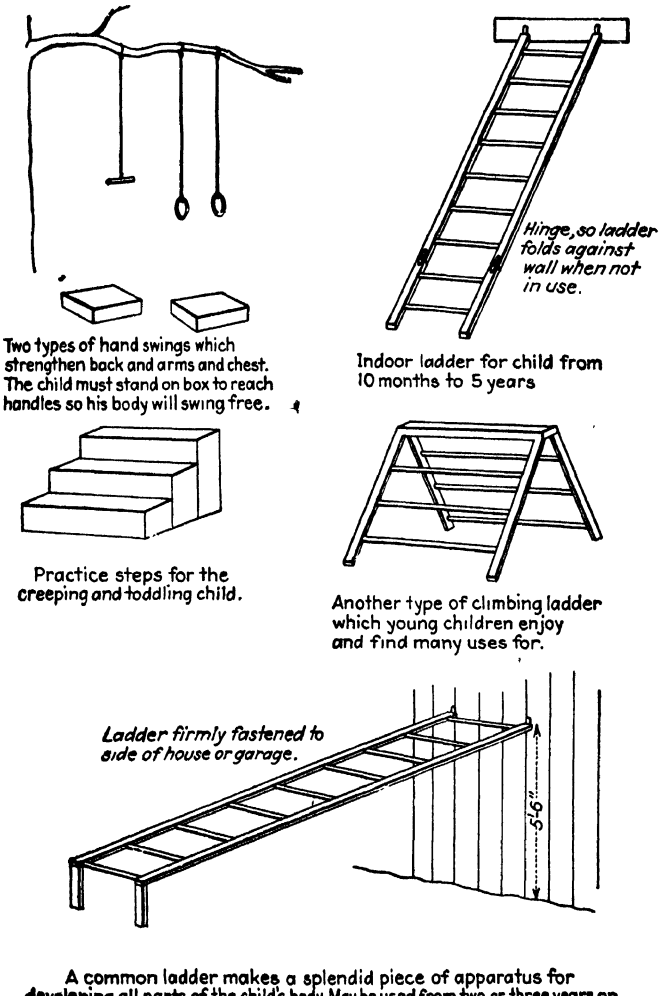


FIG. 19.—The child should have equipment for climbing and swinging.

provided with homemade trapeze, ladder, flying rings, giant stride, and every possible device for straightening and symmetrically developing the body (Figs. 22–25).

Chair and play table should fit the size of the child. The chair should permit the child to sit with his hips far back and his feet upon the floor (Fig. 26). Stocking supporters should cross suspenderwise between the shoulders and not touch or pull in any way upon the shoulders (Fig. 14).

Schoolchildren.—There should be proper adjustment of clothing and proper adjustment of school seats. There should be an

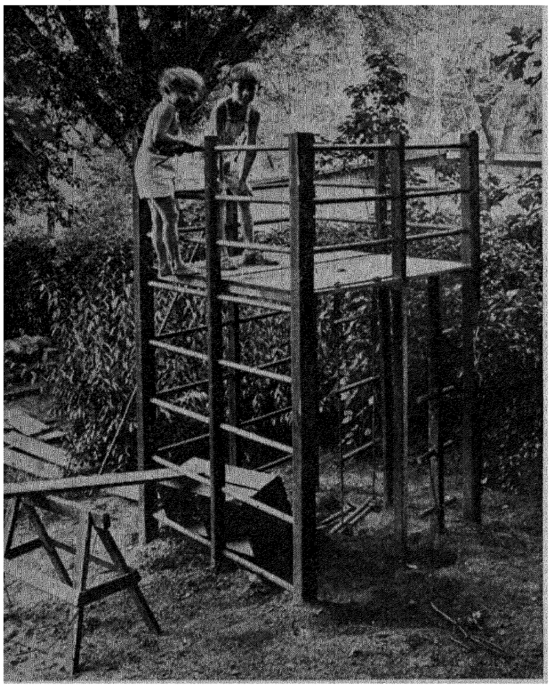


FIG. 20.—A climbing tower made by daddy.

abundance of equipment and sports designed to provide complete bodily development, and corrective training when necessary. The school should inculcate the ideal of a perfect body and emphasize out-of-door sports, such as swimming, rowing, ball, tennis, in which both hands should be used equally. For the normal right-handed child, all possible inducements should be offered for active left-handed sport.

Adults should give thought to the proper adjustment of clothing; preservation of a normal weight ratio; the habit of doing a

few corrective exercises every day to counteract the habitual forward pull of most occupations. One should alternate or

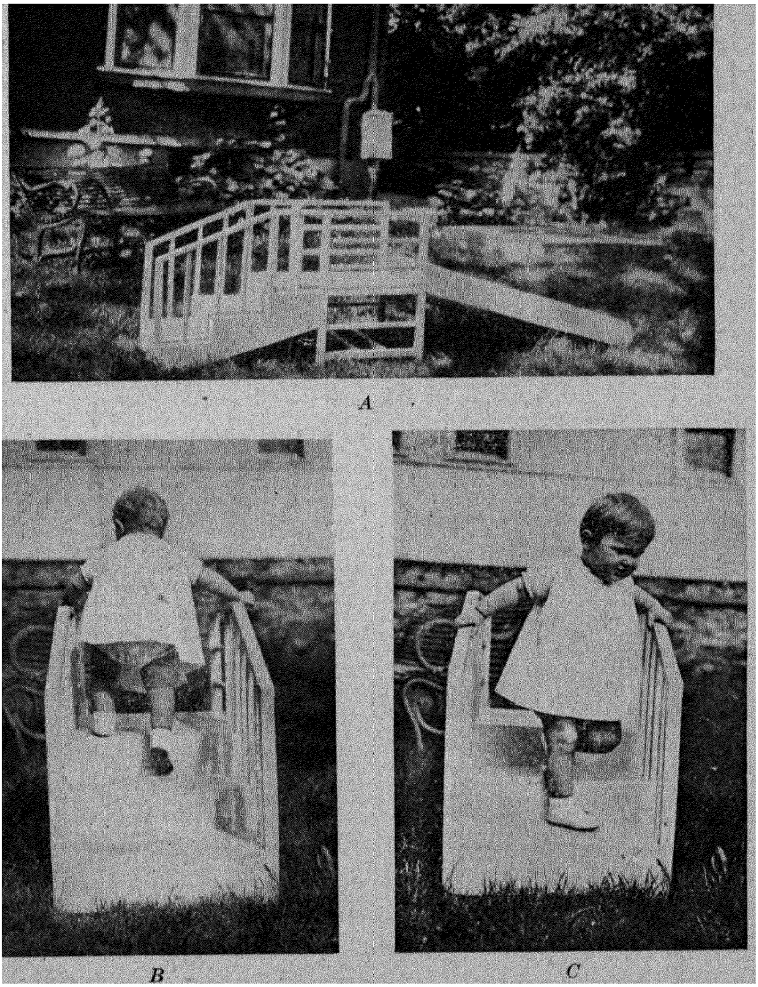


FIG. 21.—*A*, daddy made the steps *B*, Teresa on her first birthday, going up *C*, going down.

interrupt one-sided occupations so as to equalize muscle pull. One should preserve conscious ideals for the body and make a critical study of one's posture before the glass.

Exercise.—Symmetrical exercise develops and strengthens the body; improves the organic functioning; promotes the elimination of waste. On the other hand overexercise of one part of the body may develop that part to the detriment of other parts and eventually of the part or organ itself, as in the case of the athlete who becomes muscle-bound or develops a hypertrophied heart. An excellent system of exercises for the development of good posture is presented in *Posture Exercise,* Bulletin 165 of the Federal Children's Bureau; also in Chap. III of the *Handbook on Positive Health* of the Foundation for Positive Health.

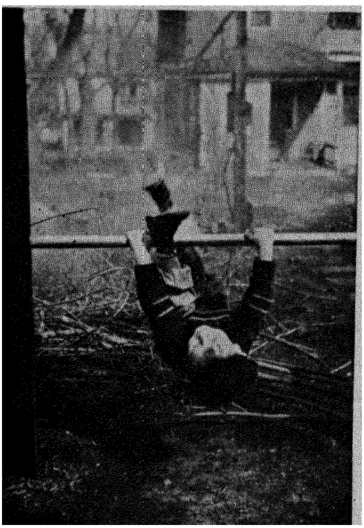


FIG. 22.—Acrobatics in the back-yard playground.

Varieties of Exercise. PLAY. Children will, if given freedom and opportunity, develop every part of the body alike. Nature puts this desire into the normal animal in the form of muscle hunger, and regulates it with muscle tire. It is a mistake to limit the range of children's activity to the use of legs and forearms, as is too often done (Fig. 27).

WORK.—Many kinds of work, especially housework, if properly related and performed with a view to correct posture and good early development, are admirably adapted to keep the body strong, shapely, and elastic.

WALKING, when properly executed with a free swinging stride, and with comfortably fitted shoes and clothing, is most exhilarating and beneficial. Between bad shoes and the automobile it is fast becoming a lost art (Figs. 28, 29, 30). The whole family should go on hikes, dressed for the part, and have a jolly time every minute.

Routine Exercises.—Every individual should use a set of exercises especially adapted to his or her occupation, development, and need. It should be a fixed habit to do these every day,

FIG. 23.—A pair of common ladders in use (*From the improvised playground at the Kansas Free Fair, Topeka.*)

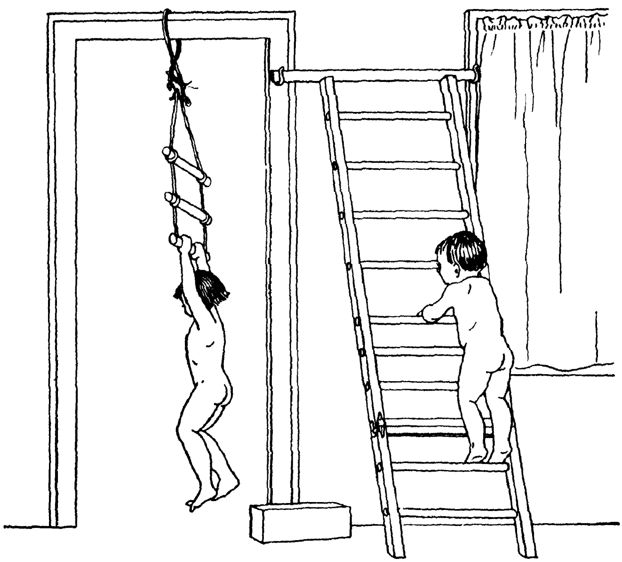


FIG. 24.—A doorway gym made from a pair of ice tongs and a broom handle. A nursery ladder which the child can use almost before he walks, hinged to fold against the wall when not in use. (*Department of Home Economics, University of Kansas.*)

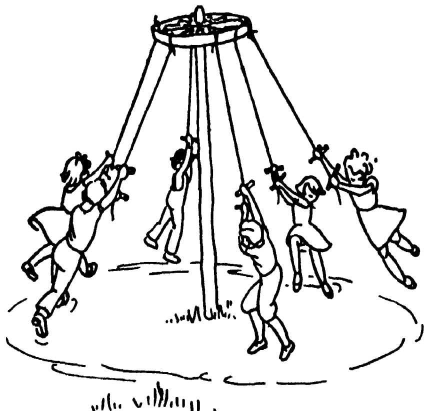


Fig. 25.—A giant stride made from a cart wheel and a post strengthens and straightens back and shoulders. (*Kansas Free Fair Playground.*)

Fig. 26.—The chair should permit the child to sit with his feet upon the floor or ground.

Fig. 27.—A foot swing Grasping the log with the feet strengthens the arches. The swaying of the swing exercises the muscles of the back.

especially a few corrective exercises to offset the particular pull of one's daily work. With the progress of age, this is indispensable to the preservation of elasticity and body tone.

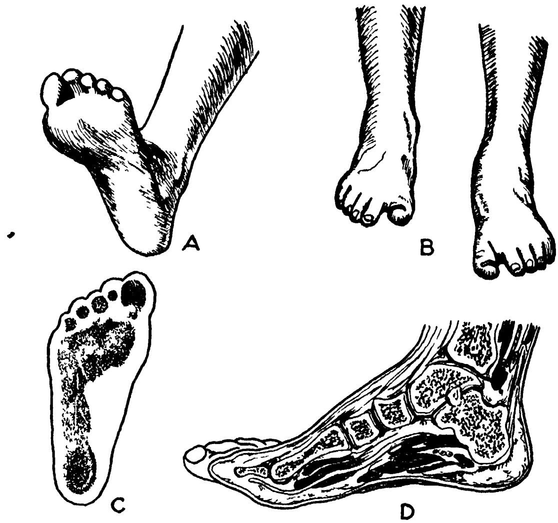


FIG. 28.—The normal foot. (*A, B, C, from Foot Health, Metropolitan Life Insurance Company*) (*D, from Morris, Human Anatomy, P. Blakiston's Son & Company*)

Sports.—More use should be made of sports as means of preserving elasticity and vigor as well as of experiencing pleasure. Not only should all ages know how to swim and row and ride and play various games, but all ages should regularly indulge in them.

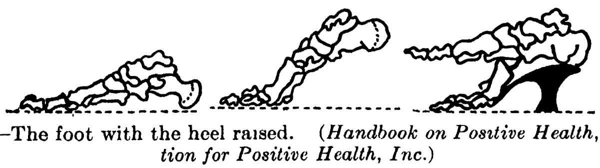


FIG. 29.—The foot with the heel raised. (*Handbook on Positive Health, Foundation for Positive Health, Inc.*)

Folk games and folk dances should become general in this country, as in certain European countries, as mediums of wholesome social frolic and exhilarating exercise. All ages should participate in these. An occasional rollicking game of blindman's buff or drop-the-handkerchief will make a mother and father feel

and look ten years younger and help cement a lasting friendship and understanding between parents and children.

Ability to Relax.—Relaxing is the opposite of exercise and is equally important. Many women hold their muscles at a tension

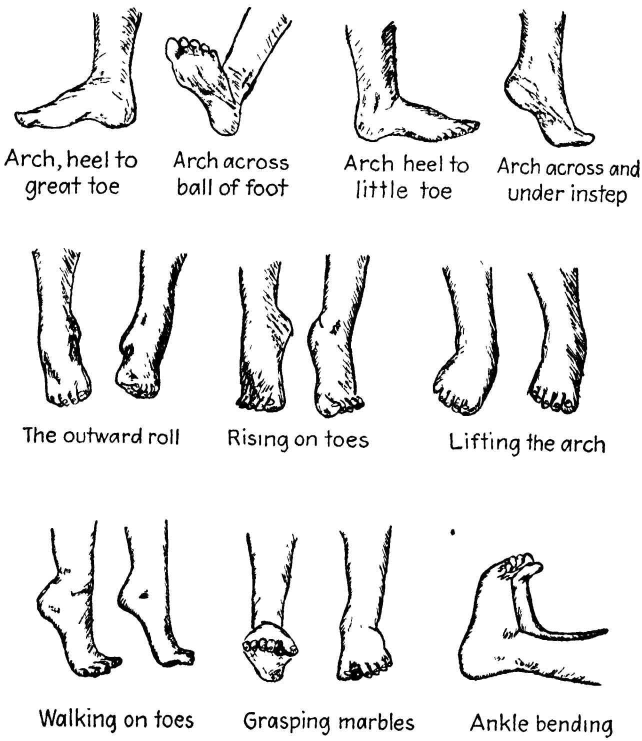


FIG. 30.—Corrective exercises for foot faults. (*Adapted from Foot Health, courtesy of Metropolitan Life Insurance Company.*)

during most of their waking hours. This is needlessly exhausting. It is equivalent to letting the engine of an automobile run while the owner shops for an hour, or letting the gas burn from one meal to the next. Efficiency consists in having the machine in good order and ready to run on short notice, but not in using it unnecessarily. To hold the nerves continually at half cock is to invite nervous explosion. Poise is impossible without ability to relax. All unnecessary outgo of energy should be inhibited.

The homemaker, when under continuous and exhausting strain, as in caring for illness, should frequently step out of doors and take a few deep breaths and do stretching exercises. She should also drop down perfectly limp and relax at frequent intervals, if only for three or five minutes.

FIG. 31.—Easy positions for study. *A*, in an easy chair, *B*, at a table.

References

BANCROFT, JESSIE: *Posture of School Children,* The Macmillan Company, 1912.

BENNETT, MARGARET ELAINE: *College and Life,* McGraw-Hill Book Company, Inc., 1933.

BILHUBER and POST: *Outlines in Health Education for College Women,* A. S. Barnes & Company, 1927

ETHRIDGE, MAUDE LEE: *Health Facts for College Students,* W. B. Saunders Company, 1933.

Foot Health, Metropolitan Life Insurance Company.

GLASCOW, RUTH B.: *Fundamentals in Physical Education,* Lea & Febiger, 1932.

The Handbook of Positive Health, Foundation for Positive Health, New York

HARVEY, B. C. H.: *Simple Lessons in Human Anatomy,* American Medical Association Press, 1931

KELLOGG, JAMES HARVEY: *How to Have Good Health,* "Keeping Well by Exercise," pp. 238–302, The Modern Medical Publishing Company, Battle Creek, Michigan.

KIMBER and GREY: *Anatomy and Physiology for Nurses,* The Macmillan Company, 1933.

KIRKPATRICK and HUETTNER: *Fundamentals of Health,* Ginn & Company, 1931

LANE, JANET: *Your Carriage, Madam!* John Wiley & Sons, Inc., 1934.
McKENZIE, R. TAIT: *Exercise in Education and Medicine*, W. B. Saunders Company, 3d ed., 1925.
MEREDITH, FLORENCE L.: *Hygiene*, P. Blakiston's Son & Company, 1932.
MILLER, NORMAN F.: "Posture Studies in Gynecology," *Journal of the American Medical Association*, Nov. 19, 1927.
MORRIS, J.: *Human Anatomy*, P. Blakiston's Son & Company, 1933
MURPHY, FRANK G.: "Poise, Pose and Posture," *Hygeia*, June, 1936
Posture, Office of Cooperative Extension Service, Department of Agriculture, Washington, D. C.
Posture Exercises, Children's Bureau, U. S. Dept. of Labor, Washington, D. C.
SEHAM and SEHAM: *The Tired Child*, J. B. Lippincott Company, 1926.
STAFFORD, GEORGE T.: *Preventive and Corrective Physical Education*, A. S. Barnes & Company, 1928.
Standing Up to Life, Metropolitan Life Insurance Company.
SWEENEY, KING, WILSON, and OTHERS: *A Method of Recording the Posture of Pre-school Children*, Merrill-Palmer School, Detroit, 1928
U. S. Public Health Service: Miscellaneous Publication No. 17, *Prevention of Disease and Care of the Sick.*
———: Stirling, E. B., *The Posture of the School Child in Relation to Nutrition, etc.*, Public Health Reports, Vol. 37, 1920.
———: *Studies in Physical Development*—Posture, I, II, III (pub. 179); IV (pub. 199).
———: Supplement No. 24, *Exercise and Health.*
White House Conference Report, *Body Mechanics*, Century Company, 1932
WILLIAMS, MAUD SMITH: *Growing Straight*, A. S. Barnes & Company, 1930
WOOD, T. D.: *A Source Book of Health and Physical Education*, The Macmillan Company, 1925.
WOOTTEN, KATHLEEN W.: *A Health Workbook for College Freshmen*, A. S. Barnes & Company, 1934

New Terms in Chaps. VI to XI

Acidosis. A lowering of the alkali content or reserve of the body, when extreme, is called acid intoxication; treated by administration of alkali.

Alkaline. Having the reaction of an alkali—a substance which turns litmus paper blue, forms soap when combined with fatty acids, has a bitter taste, etc. Alkalies must be neutralized with acids.

Amino acids. Acid compounds containing nitrogen which are the structural units of the proteins.

Antiseptic. A substance inhibiting the growth of microorganisms.

Anus. The external opening of the rectum.

Ash. The incombustible residue remaining after anything is burned; is sometimes applied to food minerals.

Basal metabolism. The amount of heat or energy production necessary merely to support life: maintain normal body temperature, circulation, breathing, etc , when fasting and in complete rest.

Buffer. Compounds which react with either acids or alkalies, but chiefly, in the body, neutralize the acid wastes produced by physiological activity.

Calorie. The amount of heat required to raise 1 kilogram of water 1 degree centigrade. When applied to food combustion in the body it means the equivalent amount of oxidation or burning of food fuels in the tissues.

Calorimeter. A "heat meter"; an apparatus for measuring the amount of heat produced within the body.

Carbohydrate. Compounds of carbon, hydrogen, and oxygen in which the hydrogen and oxygen are usually found in the proportion (H_2O) to form water.

Caries. Decay of bone or tooth structure.

Cecum. The blind end at the beginning of the large intestine; the small bowel enters the side of the end of the large bowel.

Calciferol. A crystalline compound obtained from ergosterol by irradiation with ultraviolet rays and believed to be a form of vitamin D.

Cellulose. A carbohydrate substance forming the skeleton of leaves and plants and enveloping starch granules, hulls of grain, etc.; "roughage."

Cerebrospinal. Pertaining to the brain and spinal cord

Chlorophyll. The green coloring matter in plants which corresponds in function to hemoglobin in the animal.

Cholesterol. A fatlike substance found in all animal fats and oils and in many body tissues.

Deficiency. As applied to disease most commonly means a condition created by lack of some essential factor in the diet.

Detoxicating. Having the quality of removing the toxic properties of a poison.

Duodenum. The first 12 inches of the small intestine as it leaves the stomach.

Enzyme. An organic catalyst, or ferment; a substance which causes chemical changes to occur in other substances without entering into the formation of the new compound.

Ergosterol. A derivative of cholesterol which is found in the plant ergot and in other plant and animal tissues, and which, when irradiated with ultraviolet rays, produces vitamin D.

Fatty acids. Acid components of fats which form salts when combined with certain alkalies, form soaps, and set free glycerol

Feces. Food waste or residue as found in the intestinal canal.

Gastric. Pertaining to the stomach.

Genitourinary. Pertaining to the reproductive organs in connection with the kidneys and bladder.

Glycerol. Same as glycerine; the part remaining after the fatty acids are removed from fats and oils by saponification

Glycogen. "Liver sugar," the form in which sugar is stored in the liver and muscle.

Hemoglobin. The red coloring matter of the blood, which contains iron and which carries oxygen to the tissues

Hemorrhoids. Enlargements of the veins in the rectum.

Hydrochloric acid. One of the digestive secretions of the stomach

Ilium. The flaring portion of the hip bone.

Insulin. The endocrine secretion (hormone) from the Islands of Langerhans in the pancreas which is essential to the chemistry of sugar in the tissues.

Lactic acid. An acid formed in milk from the fermentive action of lactic acid bacilli, also formed in animal tissue in muscular activity.

Laryngitis. Inflammation of the larynx, the organ of voice.

Lipids. Fats and related compounds including sterols and phospholipids

Metabolism. The sum total of chemical changes taking place in any living organism.

Mineral. Any inorganic substance.

Narcotic. Sleep producing; a drug producing unconsciousness.

Normal saltiness. Also called physiological saltiness—the saltiness of tears, sweat, blood serum, and other body fluids.

Nutrition. The process by which food is assimilated by the body.

Odontoblasts. Cells from which the dentine or body of the tooth is developed.

Osmosis. The passage of substances in solution through an animal membrane such as a cell surface or a capillary wall.

Oxidized. Combined with oxygen or "burned."

Pancreatic secretions. Digestive fluids secreted by the pancreas and emptied through ducts into the duodenum.

Pellagra. A disease caused by deficiency of vitamin G.

Pepsin. An enzyme secreted by glands of the stomach which, in the presence of hydrochloric acid, reduces protein foods to simpler forms.

Peristalsis. Wavelike muscular movement as found in the intestinal wall, Fallopian tube, etc.

Phospholipid. A lipid containing phosphorus.

Phytosterol. Sterol as found in plant cells.

Protein. Organic compounds containing oxygen, carbon, hydrogen and nitrogen. The structural units of proteins are the amino acids.

Provitamin. A substance which must be present before certain vitamins are formed

Ptyalin. The digestive ferment in the saliva which reduces sugars and starches to simpler forms.

Purine (purin). The name given to uric acid and certain other nitrogen-containing waste products.

Rachitis (rickets). A deficiency disease caused by lack of vitamin D and affecting bone structure and soft tissues of very young children.

Scurvy. A deficiency disease caused by lack of vitamin C

Sigmoid flexure. The enlarged end of the colon, in which fecal matter is stored between evacuations.

Sphincter. A ringlike muscle closing any body opening.

Sterol. A lipoid substance widely distributed in plant and animal tissues.

Synthesized. Manufactured or combined artificially.

Thermostat. An apparatus for the automatic regulation of heat.

Trophic. Pertaining to nutrition

Ultraviolet rays. Rays beyond the visible violet end of the light spectrum and lying between the visible violet rays and the X-rays.

Varicose veins. Chronic enlargement of superficial veins

Villi. Minute projections from the mucous lining of the intestine in which are contained lymph and blood vessels and mucous glands. The villi absorb nutriment and secrete mucus.

Viosterol. A concentrated artificial form of vitamin D derived from irradiated ergosterol.

Vitamins. A group of catalytic substances (sometimes called "plant hormones") found in natural plant and animal foods and essential to normal metabolism.

CHAPTER VI

THE DIGESTIVE SYSTEM

The digestive system comprises a series of chemical laboratories operating in a highly integrated manner under centralized control very similar to that in any factory, such as a paper mill, or flour mill, where raw material is transformed, by successive, related processes, into some specific end product—in this case forming living tissue and producing energy (Fig. 32).

The mouth with the throat is the gateway to the body, and also the initial processing laboratory. Food, water, and air—all may be contaminated by a dirty, diseased mouth. It is more important that the mouth be clean than that the face be clean.

The functioning parts of the mouth are the tongue, the teeth, and the salivary glands. The tongue helps mix the food mass, supplies sense of taste through the taste buds, supplies sense of heat and cold through special nerve endings, and assists in swallowing. It also carries some protective tonsillar tissue at its base called the lingual or tongue tonsil (Fig. 33). The teeth grind and cut the food, reducing it to such consistency that digestive juices may act upon it. The salivary glands secrete saliva for lubrication and moistening food, exercise through the enzyme ptyalin some digestive action upon the starches, maintain the slightly alkaline reaction essential to dental health, and assist in maintaining the fluid balance of the body (see page 104) through regulating thirst and liquefying the food mass.

The stomach is the second process room, in which food is further pulverized by the peristaltic movement of the gastric muscles. The carbohydrate food which has been masticated and mixed with the enzyme ptyalin in the mouth is partially digested in the upper end of the stomach. Ptyalin action ceases as the alkaline food mass becomes acidified through mixture with the gastric hydrochloric acid. The food is then mixed with the pepsin secreted by the glands within the wall, which partially digest

certain proteins; mixed with the digestive ferment rennin, which coagulates milk protein (casein); mixed with enzymes which partially digest emulsified fats; mixed with hydrochloric acid, which softens the cellulose and arrests the action of ptyalin; mixed with an antianemic factor which seems to be essential to

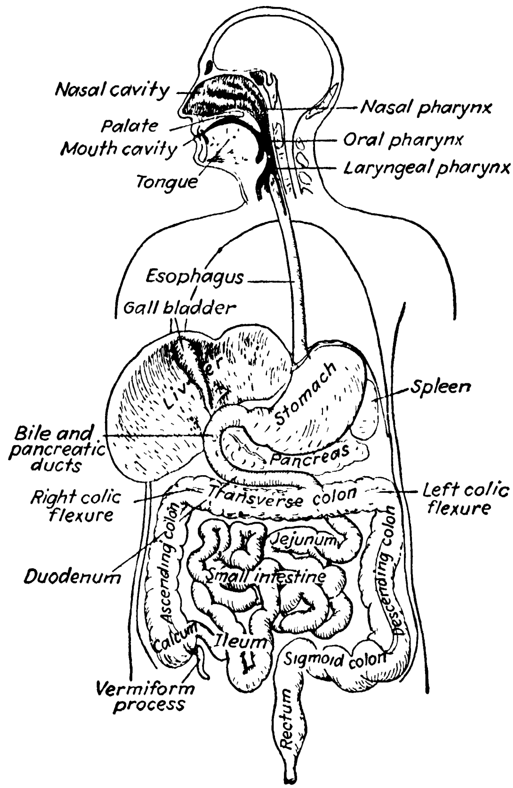


FIG. 32.—Diagram of the digestive system. (*Morris, Human Anatomy, P. Blakiston's Son & Company.*)

blood formation;[1] partially freed from injurious microorganisms through the antiseptic action of the acid fluid.

The liver is the largest gland in the body and performs many and complex chemical functions. The blood capillaries in the

[1] MORRIS, SCHIFF, and OTHERS, "Endocrine from Gastric Juice," *Journal of the American Medical Association*, Jan. 21, 1933; BEAUMONT and DODD, *Recent Advances in Medicine*, P. Blakiston's Son & Company, 1934.

villi of the intestines (see page 62) take up the products of digestion and carry them by way of the portal circulation (see page 62) to the liver. The liver then stores some of these products and changes the character of others, and filters into the blood passing through it just the amount of amino acids, glucose, minerals, and vitamins which is necessary to preserve the very stable composition of the blood (see page 108). The liver

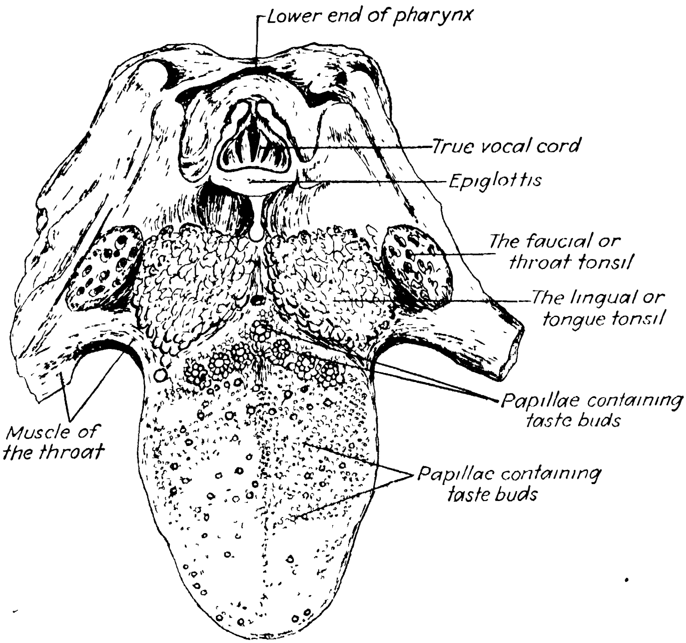


FIG. 33.—The tongue. (*Morris, Human Anatomy, P. Blakiston's Son & Company.*)

manufactures each day approximately a pint of bile, which is stored in the gall bladder and released "on demand" into the small intestine, where it assists in the digestion of fats and acts as an antiseptic and a stimulus to peristaltic action.

The pancreas, in addition to containing the ductless glands which secrete insulin (see page 133), secretes various enzymes which continue the digestion of protein, fats, and carbohydrates from the state in which they leave the stomach. The pancreatic "secretions" are poured into the duodenum a short distance from

its junction with the stomach. More than a pint of pancreatic fluid is secreted daily.

The small intestine is a process room 20 to 25 feet long (Figs. 34, 35). The first part, about 11 or 12 inches long, known as the duodenum, is the most active in digestion The pancreas and liver both empty their secretions into the duodenum through

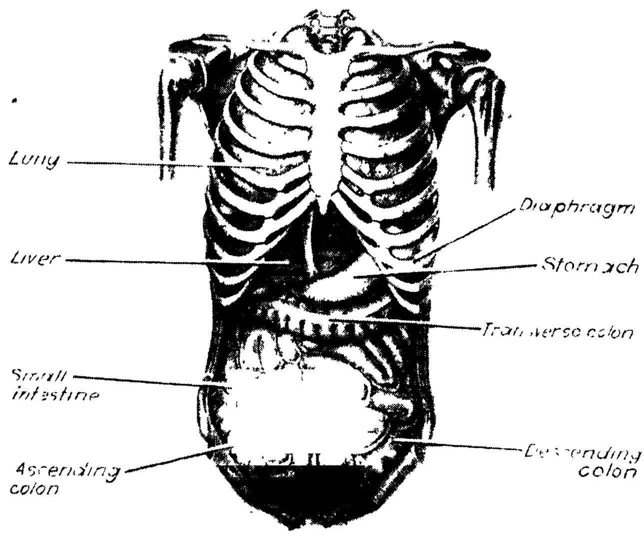


FIG. 34 Skeleton of trunk, anterior view, showing viscera in situ (*Warren, Handbook of Anatomy, Harvard University Press*)

ducts. In a very interesting way different secretions are poured into the intestine, and each selects and digests certain food elements. The chief functions of the small intestine are: (1) the continued mixing and moving of the food mass by the wormlike movement of the muscular intestinal walls; (2) the liquefying and alkalinizing of the food mass so that it may be taken up by the body fluids; (3) the digestion of starches by special digestive enzymes secreted by the pancreas and by intestinal glands; (4) the further digestion of proteins by certain other digestive secretions of the pancreas and intestine; (5) the further preparation of fats for absorption.

The Large Intestine.—The small intestine opens into the side of the end of the large intestine, which is called the cecum; the appendix is attached to the center of the end of the cecum and is apparently a disappearing remnant of a longer large bowel or colon found in some lower orders (Fig. 36). The cecum is found in the lower right quarter of the abdomen halfway between the umbilicus (navel) and the crest of the ilium (hipbone). From the cecum the colon runs up to the underside of the liver, bends abruptly, crosses the abdomen, makes another bend under and

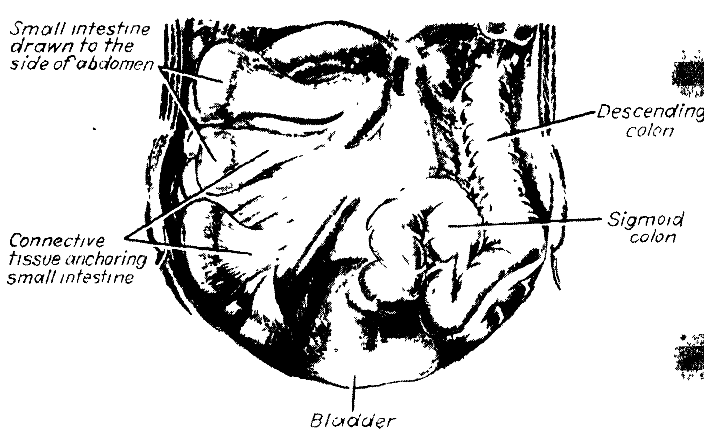


FIG. 35.—Abdomen showing small intestines with mesentery attached, turned to right of the body and showing descending colon and sigmoid. (*Warren, Handbook of Anatomy, Harvard University Press.*)

behind the stomach, and descends the left side of the abdomen. At the place on the left side corresponding to the location of the appendix and cecum on the right the colon merges into the sigmoid flexure, and below this is the rectum (Fig. 32).

The function of the sigmoid is to regulate the discharge of food residue into the rectum. It is capable of great distention, and on occasion may hold an enormous quantity of fecal matter. Habitual constipation may predispose to cancer of the sigmoid, at least, this is the usual site of cancer of the bowel.

The rectum is the highly specialized passageway out of the body. As it leaves the sigmoid it is large and elastic, but it

narrows somewhat until it ends in the sphincter or anal ring (Fig. 37). The entrance and escape of fecal matter are regulated by valvelike folds of lining membrane (Fig. 61). The rectum

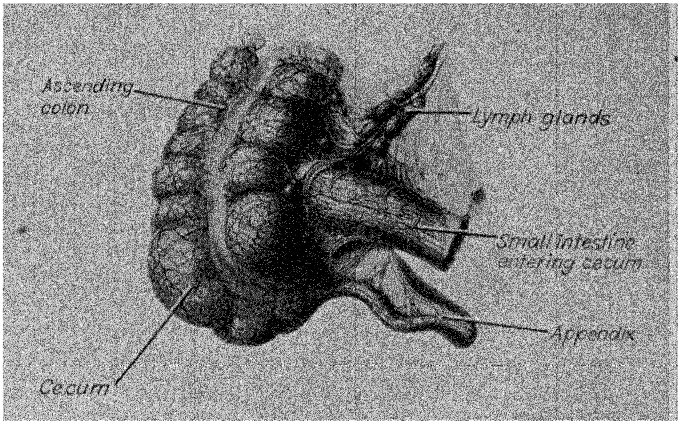


FIG. 36.—The cecum, appendix, and small intestine showing lymph vessels and glands. (*Morris, Human Anatomy, P. Blakiston's Son & Company.*)

should be empty except at the time of evacuation. The entrance of fecal matter from the sigmoid is normally the signal for immediate evacuation of the bowel. The lining of the rectum is richly supplied with nerves and capillaries and in a condition of health

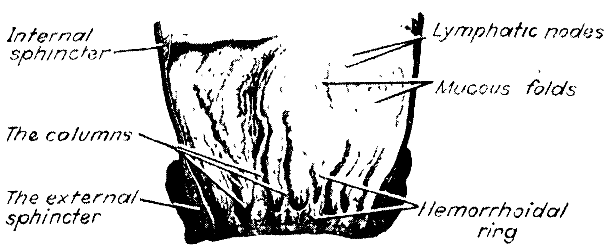


FIG. 37.—The lower part of the rectum. (*Morris, Human Anatomy, P. Blakiston's Son & Company.*)

is so sensitive to foreign matter of any sort that the introduction of anything, even a piece of cocoa butter or of slippery soap, or plain water, will set up a forcible reflex peristalsis along the

intestinal tract. Sedentary people and persons who become chronically constipated lose this sensitive reaction of the rectal nerves and muscles, and the rectum may become filled with fecal impaction and produce no impulse to evacuation. The pressure of fecal impaction, or constant sitting without corrective or compensating exercises, especially when coupled with general lack of tone or constant fatigue, is apt to produce varicose veins in the rectum, called piles or hemorrhoids, and is also a cause of reflex nervous irritation.

Absorption of Food.—Absorption of certain foods begins in the stomach. This explains why we begin to feel refreshed at once after eating when we are hungry. It also indicates the necessity for promptly washing out the stomach in case poison has been swallowed.

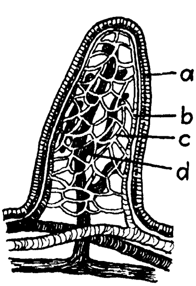


FIG. 38.—Diagram of the structure of the villi. *a*, mucous membrane, *b*, an artery; *c*, blood capillaries; *d*, a lacteal or lymph vessel. (*Eddy, A Text-book in General Physiology and Anatomy, American Book Company.*)

The most important part of absorption takes place from the small intestine. The gross absorptive surface of the small intestine is estimated at about 8,800 square inches or 60 square feet.[1] As fast as it is made ready the digested product filters into the tiny blood and lymph vessels in the villi of the intestinal wall (Fig. 38). These vessels unite to form larger vessels, called collectively the portal system, which carry most of the liquefied products of digestion to the liver. The lymphatics carry away most of the fat and empty it into the large veins of the neck (see page 106).

The blood finally carries nutrients to the tissue cells of every part of the body. Normally, if a well-balanced ration is eaten and well chewed and a proper amount of fluid drunk, the digestive machinery will run smoothly and every cell will be well nourished and healthy. When food improper in kinds or amount is eaten, or when substances foreign to the body chemistry are introduced, the body suffers in one or more of many possible ways.

Disposition of Food Residue.—The indigestible and undigested food residue is eliminated by the bowel as fecal matter. Excess

[1] HARVEY, B. C. H., *Simple Lessons in Human Anatomy*, p. 192, American Medical Association Press, 1931.

of starches and sugars is stored in the muscles and liver as glycogen or may be converted into fat and stored in the connec-

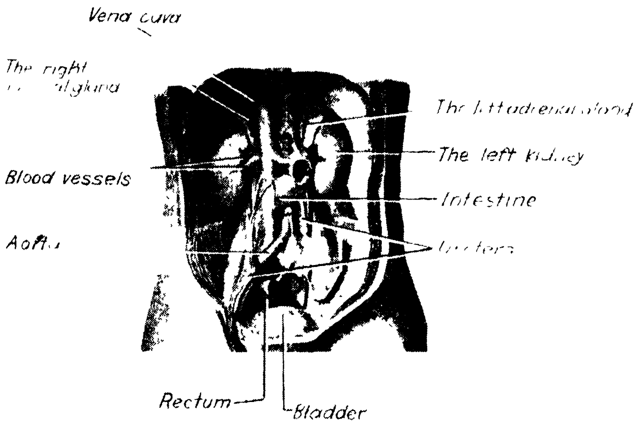


FIG. 39.—Kidneys, suprarenals, ureters and bladder from the front. (*From Spalteholtz, S. Herzil Publisher.*)

tive tissue spaces of different parts of the body. Some fat may leave the body with the feces, and some excess sugar may be eliminated in the urine. Excess of proteins cannot be stored as

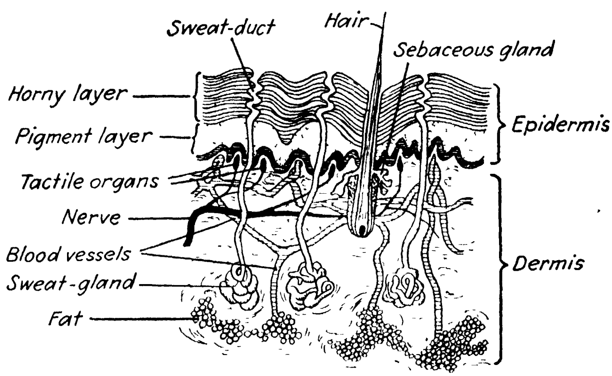


FIG. 40.—Diagrammatic section of the skin. (*Eddy, A Text-book in General Physiology and Anatomy, American Book Company.*)

such, but some carbohydrate may be formed from deaminization of the amino acids in the protein molecule after it is broken

down (see page 71). All excess of minerals and products of cell activity which have no further function in the body must be eliminated by the kidneys, bowels, or skin.

Elimination of Fluids.—The kidneys are the chief organs of elimination of fluids (Fig. 39). In health, with the ingestion of a normal amount of liquids, about 4 pints of urine are passed in 24 hours by the average adult. *The skin* eliminates another pint or so of water by insensible perspiration and may excrete much more when one is sweating freely (Fig. 40). Perspiration removes waste materials in solution and helps regulate the temperature of the body. It is important to remember that perspiration is a salt solution and that excessive sweating may deplete the body of its normal saltiness (see page 457). *The lungs* give out in the moist air of the breath another pint or more. It will thus appear that it is very important that plenty of water should be taken into the body to replace the amounts lost and also to enable the kidneys to do their work freely and without irritation from concentrated mineral waste.

References

Beaumont and Dodd: *Recent Advances in Medicine*, P. Blakiston's Son & Company, 1934.

Cannon, W. B.: *Mechanical Factors of Digestion*, International Medical Monographs, 1911.

———: *The Wisdom of the Body*, W. W. Norton & Company, Inc., 1932.

Crandall, Lathan A., Jr.: *An Introduction to Human Physiology*, W. B. Saunders Company, 1934.

Harvey, B. C. H.: *Simple Lessons in Human Anatomy*, American Medical Association Press, 1931.

Howell, W. H.: *Textbook of Physiology*, W. B. Saunders Company, 1931.

Kirkpatrick and Huettner: *Fundamentals of Health*, Ginn & Company, 1931.

Martin, H. N.: *The Human Body*, 12th ed., Henry Holt & Company, 1934.

Morris and Schiff: "Endocrine from Gastric Juice," *Journal of the American Medical Association*, Jan. 21, 1933.

CHAPTER VII

FOOD NEEDS OF THE BODY

We should eat to live and not live to eat.
MOLIÉRE

Health, disease, and life itself, as has been said, are strictly matters of chemistry. Of the 92 known elements of the earth, the 18 here listed are known to have become organized to form the stuff-of-all-life, protoplasm (see page 20).

Element	Approximate Per Cent in Body[1]
Oxygen	65.0
Carbon	18 0
Hydrogen	10.0
Nitrogen	3 0
Calcium	1 5
Phosphorus	1 0
Potassium	0 35
Sulphur	0 25
Sodium	0.15
Chlorine	0 15
Magnesium	0 05
Iron	0 004
Iodine	0 00004
Copper, Manganese, Zinc, Fluorine, Silicon	Very minute amounts

The study of the countless ways in which these 18 (or more) elements can combine, forming literally innumerable varieties of natural living forms (protoplasms), is really the basis of all study of nutrition, of growth, of infections (see page 117), and of heredity (see page 26).

[1] SHERMAN, H. C., *Chemistry of Food and Nutrition*, p. 236, The Macmillan Company, 1932.

The peculiar arrangement of these substances of life in the form of a mass of spongy, colloidal protoplasm in which is embedded a denser mass of protoplasm, called the nucleus, produces the living cell (see page 21), which has the peculiar property of carrying on constant chemical change within its structure and at the same time replacing, from the fluid environment, any chemical substance used or changed by its activity. This perpetual chemical integration with environment is known as *nutrition;* the processes by which nutrition is maintained is called *metabolism;* and the total exact chemical requirements of the body cells, were it possible to compute these at any given moment, would express the "balanced diet." While it is not humanly possible to compute the constantly varying chemical needs of the body with such precision, it is possible to do so within practical limits.

The food needs of the body vary with age, body build, climate, activity, and state of health. The growing child requires food in proportion to his growth rate and his activity with its consequent tissue repair; the adult in proportion only to his tissue repair and his activity. All require more fuel foods when subjected to cold. A thin person wearing insufficient clothing burns more body fuel than a fat and warmly clad person The larger the framework of the body the more food required for maintenance. The more active the individual the more fuel his body consumes and the more tissue he must repair.

The body in the first place uses food for replacement or repair of its various tissues, for growth, and for the manufacture of specific compounds (hormones, enzymes, and antibodies) which control cell activity; secondly, it requires food for fuel. This fuel is literally burned (oxidized) in the cells of the body to release energy, which is converted into movement and heat.

The animal body is a highly efficient combustion engine. It must have fuel (food) and draft (air in lungs), and the ashes must be removed regularly (body and food waste). A good fireman who is familiar with his particular furnace knows with great exactness the type of fuel from which he secures the highest production of steam. He knows how much fuel he must use to cause the engine to "idle along," barely making steam, yet not permitting the boilers to cool—keeping them ready to go. He

knows how much fuel he must furnish and how fast he must feed the fire in order to produce moderate or high steam pressure or work output. In similar manner the nutrition scientists know approximately how much food is required to keep the living machine operating when at rest, as in sleep or in waking relaxation (basal metabolism), and how much is required to provide for various degrees and kinds of bodily activity.[1]

Since combustion invariably creates heat, a stated amount of oxidation always producing a corresponding amount of heat whether in the burning of coal in a grate or sugar in muscle, it has become the custom to measure metabolism or the energy requirement in terms of the heat the specified food will release when burned either in tissues or in a furnace. A measured amount of fat and sugar produces much heat and a similar measure of lettuce little, whether burned in a laboratory or in the muscles of an athlete. The unit of heat measure is the calorie, which is the amount of heat required to raise 1 kilogram of water 1 degree Centigrade, or 4 pounds of water 1 degree Fahrenheit.

It is the custom to discuss the fuel or energy value of foods in terms of calories. However, the caloric value of food is not the only measure of its value. Foods may burn easily or with difficulty under the varying chemical conditions of the body and according to the way in which the carbon is combined with other factors in the food molecule. Proteins and carbohydrates have approximately equal fuel value per gram of weight, while fats

[1] DAILY ENERGY REQUIREMENT ACCORDING TO OCCUPATION

Type of occupation	Total calories per day		Calories per kilogram per day	
	Men	Women	Men	Women
At rest but sitting most of day	2,000–2,300	1,600–1,800	31	30
Work chiefly done sitting	2,000–2,800	2,000–2,200	36	38
Work chiefly done standing or walking	2,700–3,000	2,200–2,500	41	42
Work developing muscular strength	3,000–3,500	2,500–3,000	46	49

[1] ROSE, MARY SWARTZ, *The Foundations of Nutrition*, p 63, The Macmillan Company, 1933.

burn most readily of all. Furthermore, the sciences of biochemistry and physiology have revealed the fact that the food energy cannot be utilized by the body unless chemical factors other than combustion capacity are provided in the food, chief among which are certain food vitamins and certain food minerals. The chemical changes involved in living activity and growth are exceedingly complex, and the chemical mechanisms provided for maintaining these balances are bewilderingly intricate and delicate. Many points are not yet clear, but enough is now known to make it possible to eat for health. It becomes a matter of personal obligation and duty for every student who would maintain a high degree of personal health and who would like to be able to feed her family intelligently to inform herself as to the basic principles of food selection. The wide range and number of commercial food materials now prepared and presented to the public make it imperative that everyone be informed and intelligent. When foods were obtained from natural sources more akin to conditions under which the human body has evolved, varied and precise food selection was not possible, nor was it so important as it is under present conditions.

Basal metabolism represents the fuel consumption of the body when it is "idling along," merely existing. The blood is circulating; the lungs are breathing; evaporation from the skin is taking place; the muscles are maintaining a certain tension or tone even during sleep. The fairly regular consumption of food fuel by the body while at rest is called basal metabolism. Basal metabolism is measured by various sorts of mechanisms called calorimeters (heat measures). The normal basic metabolic rate has been computed for persons of various ages, weights, and builds and reduced to formulas which make it relatively easy to discover conformity with or deviation from normal in any given subject. It has been determined that fuel consumption while at rest and fasting is approximately 39.7 calories per square meter of body surface per hour for men and 36.9 calories for women. Deviation is commonly expressed as per cent plus or minus compared with the normal basal rate. If a report states the basal metabolism as +10 or −10 it means 10 per cent more or less than the expected or normal rate.[1] An average-sized man will normally require

[1] Bogert, L. Jean, *Nutrition and Physical Fitness*, p. 281, W. B. Saunders Company, 1931.

about 70 calories per hour merely to support basal metabolism. When sitting still he will burn 100 calories per hour; all exertion greatly increases this rate.[1]

The heat regulation of the body is yet a mysterious process. When the basal metabolism is normal the temperature of the body as measured by a clinical thermometer will be about 98.6°F. (36.87°C.). Certain features of temperature regulation and adjustment, such as sweating, flushing, chilling, goose flesh, etc. are obvious and familiar. It is possible that there is a definite heat-regulating center or organic thermostat in the brain, possibly in the corpus striatum[2] within the diencephalon[3] or interbrain. In addition to these devices, however, it is certain that the pituitary, adrenal, and thyroid glands participate in the heat regulation of the body. The thyroid, in particular, is exceedingly active in controlling the oxidation rate and energy production. In thyroid deficiency or hypothyroidism (see page 128) the body temperature and basal metabolism are markedly lowered. In hyperactivity of the thyroid the rate of basal metabolism is raised, sometimes as much as 100 per cent. The body is burning its own tissues. Any condition impairing general vitality may reduce the basal metabolism. Thyroxin (the internal secretion of the thyroid) is sometimes given medicinally to stimulate oxidation of food and thereby increase bodily energy and raise the basal metabolism.

[1] SHERMAN, H. C , *Food and Health,* Chap. III, The Macmillan Company, 1934.

[2] HOWELL, W. H., *Textbook of Physiology,* pp. 1005–1015, W. B. Saunders Company, 1931.

[3] CANNON, W. B., *The Wisdom of the Body,* p. 199, W. W. Norton & Company, Inc., 1932

CHAPTER VIII

THE CHEMISTRY OF FOODS

Foods are divided into three general classes: proteins, carbohydrates, and fats. The balanced diet must be composed of a proper proportion of these, which is generally accepted as being about 10 to 15 per cent from so-called protein foods; 40 to 60 per cent from carbohydrate foods; 30 to 35 per cent from fats. Some latitude is permitted in the selection of fats and carbohydrates, although a certain relationship must be maintained. Although both are energy fuels they cannot be substituted one for the other beyond a certain point. In addition to the three general divisions, important accessory food substances must be included. These are the vitamins and minerals, which, fortunately, are found incorporated with many foods in their natural state. Selecting proteins, fats, and carbohydrates which carry a maximum of accessory protective factors is very important.

Proteins are named first because of their unique function in providing structural materials for protoplasm and in particular for the cell engine, the nucleus, with its protein chromosomes and genes. It is believed that it is the genes within the chromosomes which contain the pattern of the organism and determine all behavior and all hereditary characteristics, both physical and mental. The protein molecule is made up of combinations of amino acids, some 30 of which are known (with the discovery of others imminent).

The proteins contain carbon, hydrogen, oxygen, nitrogen, and usually sulphur. In addition to these elements, many proteins contain phosphorus, sometimes iron, and sometimes a carbohydrate radical. These help to give to each protein its specific character and function. *The proteins are the only food substances (with the exception of certain vitamins) known to contain nitrogen.* The amino acids are sometimes called "the nitrogen bearers." The role of nitrogen in cell chemistry is exceedingly important.

The 30 (or more) amino acids combine to form literally innumerable specific proteins.

Protein is found, actually, in all protoplasm and concentrated in every cell nucleus, and hence occurs in all organic foods. The amount in many foods is so small, however, as to be negligible. By "protein foods" is meant those supplying considerable concentration of nitrogen or protein. Among the amino acids entering into the structure of cell nuclei in the human organisms are 8 or 10 which cannot be synthesized or constructed in the body and which are not commonly found in usable form in vegetable proteins. It would be difficult to secure these in amounts sufficient for human nutrition from any desirable vegetable sources. These are called "the indispensable amino acids," and proteins containing all of these are known as "complete proteins." Some of the 10 to 15 per cent of calories assigned to protein should accordingly be selected from complete proteins, chiefly animal protein. The animal proteins are found in milk curd, egg white and yolk, edible organs, and flesh from fish, fowl, and muscle meat. Gelatin, an animal protein formed from connective tissue, is lacking in indispensable amino acids. Gelatin is a valuable article of food, but must be supplemented by other proteins which are complete.

The animal proteins are said to have high biological value. Of these milk is considered to be the one best source because it also contains important minerals (notably calcium and phosphorus), and vitamins (notably vitamins A and G), and burns in the body with an alkaline ash (see page 84). Egg white is almost pure protein (albumin), and is also valuable because it contains sulphur. The egg yolk also contains some protein and is rich in important minerals and vitamins (notably vitamins A and D, and the minerals iron, calcium, and phosphorus). The edible animal organs, especially liver and fowl gizzard, are rich in blood-forming elements and have some of the important vitamins stored in their structures. Meat fiber furnishes protein of good quality, but is lacking in calcium and vitamin C. Moreover meat proteins form more uric acid and toxic substances (purin bases) than do most other proteins, and are acid-forming in their mineral residue. Meat is relatively expensive and need not be considered an essential in the diet, although there is no objection to the use of a

reasonable amount if balanced by sufficient base-forming foods. A safe, practical rule for the active person in normal health is to eat meat not over once daily. In addition to meat (if desired) once daily, the average adult should use from one pint to one quart of milk and eat the equivalent of one egg. The rest of the protein quotient will naturally be obtained from vegetables, grains, and cereals. If one secures biologically complete proteins from milk and eggs he may dispense entirely with meat. McCollum says the ideal human diet probably is a lacto-ovo-vegetarian diet.

The vegetable sources of protein are the seeds, as the legumes, including lentils, beans, peas, peanuts, nuts, and grains. Of these, nuts, soy beans, corn, and wheat do indeed contain the indispensable amino acids, but a diet incorporating enough of these to be completely protective would be undesirable from the standpoint of bulk, digestibility, and palatability. The best and most natural method is to give thought to securing every day the due quotient of the biologically important proteins and to make up the rest by eating a wide variety of protein-containing vegetable foods.

The protein molecule (see page 57) is too large to pass through the intestinal membrane; hence in the process of digestion proteins are taken apart, so to speak, and resolved into their component amino acids (see page 71). The free amino acids circulate in the blood stream, and the various cells pick up such as they require to maintain their respective nuclear patterns as they repair waste or multiply in growth.

The carbohydrates comprise *sugars*, *starches*, and *cellulose*. The carbohydrates are chiefly composed, as the name implies, of carbon combined in innumerable varying proportions with hydrogen and oxygen, which latter are usually found in the proportion to form water, H_2O (hence hydrates). Carbohydrates, like proteins, are found in foods of both animal and vegetable origin. Whole milk contains approximately 6 to 7 per cent milk sugar; meat and edible organs contain varying proportions of glycogen (a simple form of sugar). Eggs contain little carbohydrate. In the amounts usually consumed the animal foods do not contribute any considerable proportion of the carbohydrate quotient of the balanced diet. Like proteins, the carbohydrates, as found in

natural foods, must be reduced to simpler substances in digestion. Reduction of sugars and starches to the simple sugars begins in the mouth (see page 56), where the enzyme ptyalin found in saliva acts upon carbohydrates in proportion to the length of time the food remains in the mouth in chewing. Ptyalin digestion, however, is carried on chiefly in the stomach during the 30- to 60-minute interval before the food mass becomes thoroughly acidified (see page 56). Starch and sugar encased with fat in cooking are acted upon less readily by the digestive ferment. This is one reason the use of fried foods and pastry by children, invalids, and others having reduced digestive capacity is disapproved by nutrition experts.

When the food reaches the lower part of the stomach and becomes thoroughly mixed with the acid gastric juice all reduction of carbohydrates ceases. It begins again in the small intestine, where the food mass becomes alkalinized and meets the sugar-reducing ferments from the intestine. The starches, requiring a longer time for their reduction, are therefore said to be slower in digestion. This slowness is not a disadvantage, since it maintains a steady and prolonged absorption of fuel through the intestinal wall. The process is somewhat analogous to keeping up a steady fire under a boiler with slow fuel when a steady head of steam is desired, instead of making a tremendously hot fire with quick fuel.

The human body has evolved under conditions of a natural food supply including both sugars and starches; therefore it thrives best on a proper proportion of both. As between a shortage of sugar and a shortage of starch, the shortage of starch would be more detrimental.

Cellulose is the vegetable connective tissue corresponding somewhat to connective tissue in meat from which gelatin is produced, except that gelatin has definite food value while cellulose has none. The cellulose covering of seeds, grain, leaf fiber, etc., is softened by the hydrochloric acid in the stomach, thus releasing the starch and sugar not released by the chewing in the mouth. It has an important function as "roughage" in furnishing loose bulk to the food mass, conducing to free admixture with digestive fluids and also stimulating peristaltic action of the intestinal wall, particularly in the large bowel or colon, the por-

tion of the human digestive tract most resembling the bowel of the herbivorous or grass-eating animal.

The chief sources of sugar are fruits, certain tuberous vegetables, notably carrots and beets, sugar cane (in the form of molasses or syrup), and honey. The chief sources of starch are grains, seed vegetables, and tuberous and root vegetables.

Concentrated or crystallized sugar is one of the many artificial refinements of civilization, and one capable of doing serious damage to the human mechanism, which was not made to handle concentrated food substances. The dangers in the use of concentrated sugar are: (1) It is made difficult to obtain adequate cellulose, minerals, and vitamins, since these have been completely removed from beets and cane in refining, and since there is not apt to be sufficient use of fruits and other protective foods when sweets are used. (2) A quick sense of satiety is created because of the concentration. The taste buds report "we've had enough" before the other necessary food elements are eaten. This is probably the reason sweet desserts are placed at the end of the meal. (3) A habit or craving for candy, pastry, soft drinks, and excessive sugar on food is created. (4) The sugar-regulating mechanism may be overtaxed. (5) The acid-base balance[1] may be disturbed, since sugar lacks the buffer minerals[2] found in most fruits and vegetables. Certainly sugar should be used sparingly in the balanced diet.

Milled or refined flours as sources of starch present the same danger as sugar in that all the vitamins and most of the minerals have been removed. When concentrated fats in the form of "shortening" and concentrated sugar are added to refined flour to make it palatable the danger of imbalance is greatly increased.

Fats are also composed of carbon, hydrogen, and oxygen, but combined in a different chemical pattern from that found in starches and sugars. Fats are highly concentrated fuels con-

[1] Acidosis is a toxic condition created by a good many diseases and by dietetic imbalances, and by certain diseases, notably diabetes, in which there is incomplete oxidation of fatty acids (see p. 83).

[2] A buffer is a substance which is chemically sensitive; as used in physiological chemistry the term refers to a substance which aids in maintaining a neutral or alkaline reaction by combining freely with excess of either acids or bases in body fluids or tissues.

taining relatively more carbon and less oxygen than do the carbohydrates. In the body tissues fat may be made from carbohydrate although the process involved is not clear. It is well known that an excess of sugar and starch is fattening. Fat is important in the body economy not only as a current fuel but also as furnishing, through deposit in the tissues, a store of fuel which may be drawn upon to equalize immediate food-fuel shortage. Fat also serves a mechanical purpose in padding the vital organs, and in insulating the body from cold. The kidneys, for example, are surrounded by fat and if marked emaciation occurs may actually become displaced, producing considerable pain and inconvenience. Fat people bear cold well and heat badly, partly because they have plenty of fuel to burn, and partly because the fat covering the body actually insulates the blood and nerves from the cold.

Another reason fats are important is that certain of the fatlike organic substances which are associated with fats in their synthesis, notably sterol and phospholipids[1] and cholesterol are essential to all cell structure and function.

The phospholipids and cholesterol are found in the highest concentration in the most active tissue cells, being highest in the brain, which is the most active of all living tissues. The organs arranged in order of their lipid content are the brain, liver, pancreas, kidney, and lungs. Cholesterol in the skin helps make it waterproof and impervious to germs (see page 182). Ergosterol, another of the lipids, is the provitamin (see page 91) which is changed into vitamin D by the stimulus of ultraviolet rays (see page 91). Cholesterol is also said to bear a direct relation to opsonic and cytophagic immunity[2] (see page 186). Most of the fats in digestion are broken into glycerol and alkaline salts of fatty acids. The alkaline salts of some fatty acids are commonly known as soaps; hence this process is often spoken of

[1] "It is now well recognized that lipids are essential constituents of body tissues. Thus cell membranes are not simply walls of protein matter but are composed of both proteins and lipids of different kinds and in varying proportions, and protoplasm is to be thought of as an emulsion of proteins and lipids rather than a jelly of proteins alone." SHERMAN, H. C., *Chemistry of Food and Nutrition*, p. 36, The Macmillan Company, 1932.

[2] White House Conference Report, *Nutrition*, p. 101, D. Appleton-Century Company, Inc., 1932.

as *saponification*. The glycerol and fatty acids seem to be reunited as they pass through the absorption membranes of the villi and are carried, as fat, partly in the lymph, to be emptied into the general circulation by the thoracic duct (see page 106), and partly by the portal circulation (see page 62) to the liver. The specific flavors of food fats are chiefly due to differences in the fatty acids.

Fats are digestible somewhat in order of their melting points; milk fat and egg fat, having the lowest melting points of any of the food fats, are most digestible. Fats digest more slowly than sugars or carbohydrates. To an extent this is advantageous since, like starches, fat provides a prolonged supply of fuel.

The sources of food fats are animal and vegetable. Of the animal fats there is no question that milk fat, as found in whole milk, cream, butter, and full cream cheese, and egg fat are valuable and important. Milk fat has the advantage of carrying the important vitamin A and some vitamin D (see page 91). Milk fat is of particular value to the growing child and to pregnant and lactating (nursing) women.

The animal body fats, such as lard, suet, and tallow, have their place if not used to excess. The vegetable oils, such as olive, corn, and cottonseed oils, are much used in salad dressings, in cooking, and in cooking compounds and butter substitutes, and are good sources of fuel but possess no protective value.

The objection to cooking foods in fat has been mentioned (see page 73). When the fats are not heated to the point of decomposition and when proteins are not rendered leathery and insoluble by excessive heat, there may be little objection to a very moderate use of fat in cooking. It must be remembered, however, that fat requires prolonged digestion, and fried foods should not be given to children or to invalids or to anyone with whom it is important to conserve digestive effort and nutritional efficiency.

CHAPTER IX

FOOD MINERALS

Of the 17 or 18 chemical elements which make up the body and which, therefore, must appear in food (see page 65), 13 or 14 appear as compounds known as mineral salts or ash. A mineral salt is the residue or gray ash left from any combustion (burning). While the protoplasm of the body is in the main made up from the carbon-hydrogen-oxygen-nitrogen substances of the diet, the mineral salts named on page 65, even those appearing in minute traces, are indispensable to the chemistry of protoplasm. One of the most important advances of modern nutritional science is the discovery of the role of minerals in metabolism and the importance of providing adequate minerals in the diet.

Of the elements named in the list on page 65 it might be inferred that those are most important which appear in largest amount. As a matter of fact the extreme or complete withdrawal of any is serious and may be fatal. Practically, it is the custom to stress those minerals which are most likely to be inadequately provided in modern dietaries and under the conditions of present-day food supply. Calcium, in particular, may easily be deficient; while phosphorus, iodine, and iron must be given careful attention. There is little likelihood of the other minerals being lacking in any ordinary diet.

So important is mineral metabolism that certain glandular organs and vitamins have been created specifically for the regulation of particular minerals.

Calcium, phosphorus, and magnesium form a mineral trio particularly concerned with the skeletal and dental structures, although equally vital to the structure and regulation of the fluids and soft tissues. These three minerals must maintain a rather fixed ratio to each other or none can fully function. Calcium phosphate makes up 85 per cent of the bony structures and 75 per cent of the total body ash.

Magnesium constitutes only about 0.05 per cent of the body mass, but 70 per cent of this amount is found in the bones, where it exercises some regulatory function in relation to calcium and phosphorus. When there is deficiency of magnesium in the body of experimental animals the calcium is drained out of the bones, growth ceases, and extreme nervousness appears.

Calcium is as vital to the activity and composition of the soft tissues as it is to the bones. Calcium salts enter into blood clotting (see page 111) and blood calcium regulates the irritability and contractility of muscle, including the important heart muscle. In this relation a nice equilibrium must be maintained between the blood calcium on one hand and the sodium-potassium ratio on the other (see page 80). Deficiency in blood calcium produces irritability of the nerves, even to the point of convulsions or tetany.

Phosphorus in the form of phospholipids, phosphoproteins, etc., enters into the composition of all cell structures, notably brain and nerve cells (see page 148). While it is common to speak of calcium and phosphorus as being specifically concerned with bone metabolism it must be remembered that they are equally important to all other structures and to all functions of the body. The utilization of calcium and phosphorus (and possibly magnesium) depends upon the presence of vitamins C and D (see pages 89, 91) and upon the proper functioning of the anterior pituitary and parathyroid glands (see pages, 126–130). In short, calcium-phosphorus-magnesium metabolism is tied up with about every tissue and every organ of the body.

Sources.—Calcium is required in constant amount in order to maintain the blood calcium at a normal point without withdrawing calcium from the skeletal and dental structures, and without the other unfortunate alternative of producing nervousness, anemia, or softening of the bony structures as in rickets. The most important source of calcium is milk. It is very difficult to secure an adequate daily supply of calcium for adult or child—but particularly for the child, who must have a surplus for growth—without the daily use of milk. This is one reason for the general agreement among food experts at the present time that a pint for the adult and a quart for the child is necessary fully to protect the calcium needs of the individual. Green vegetables, seed vege-

tables, and some fruits also provide calcium of very good quality, but in such small concentration that one must eat an almost prohibitive amount of the specified foods to secure a regular and safe amount.

Phosphorus is likewise found in milk, green leaves, and seed vegetables, but it is also found in egg yolk and in meat, fowl, and fish. In short, the complete proteins (see page 71) are all rich in phosphorus.

Magnesium is so generally present and is required in such small amount that there is no possible danger of shortage.

The calcium-phosphorus needs vary in direct ratio to the growth activity. The growing child and the pregnant and lactating woman require a large allowance, sometimes double the need of the passive body.

Iron, copper, and manganese form the blood trio whose presence is essential to the formation of the oxygen carrier—*hemoglobin.* It has long been known that iron is essential to oxygen utilization and hence to energy production. It is a comparatively recent discovery that iron cannot function without the traces of copper mentioned in the table of body minerals, and there is evidence that manganese may play a role. Iron and copper are not stored in the body except in the liver of the fetus (see page 57), and although a small amount only is required (0.015 to 0.0175 gram of iron daily being the average amount and a trace of copper), it is highly important that the individual should get this amount every day. Copper and manganese may have other specific functions apart from the formation of hemoglobin.

While inorganic iron can be utilized in the body if the other essentials named are present, it is advantageous to secure at least a liberal amount of the iron quotient from foods supplying other essentials.

Iron is found in egg yolk, dried beans and peas, whole grains, green leaves, oysters, muscle meat, and some fruits, as figs, raisins, apricots, peaches, and prunes. Milk is low in both iron and copper; hence sufficient of both is stored in the liver before birth to supply the needs of the infant until he is about six months old (when the teeth appear and he begins to eat iron-containing foods). Copper is found in all the iron-bearing foodstuffs, especially liver, green leaves, and sea foods, and is present in

practically all foods in small amount; hence there is no possibility of the necessary trace not being present in any passable diet.

Manganese is especially concentrated in the active parts of the plant seeds, shoots, and leaves, in the edible organs but not in muscle. "Manganese has been found in the ash of all enzyme[1]-containing tissues and seems to be a most potent catalytic[1] agent."[2] It is probable that manganese plays a role in reproduction. There is no possibility of manganese deficiency.

Zinc is found in traces in the body fluids and doubtless has an important use. It may enter into the iron-copper-manganese activity in blood formation and function. Its role is not yet clear, and there is no danger of deficiency, since it is exceedingly difficult to secure a zinc-free diet for experimental work.

Sodium, Potassium, and Chlorine.—*Sodium and potassium* balance the pans of the osmotic[3] scale, sodium salts occurring in greater concentration in the fluids of the body (except milk), while potassium is concentrated in the cells. Potassium and sodium salts are important alkalies and are indispensable in neutralizing the acid waste resulting from the oxidation of body fuels (see page 74).

Potassium is more abundant in fruits and vegetables than in animal foods. It is found in all whole grains and seeds, in citrus fruits, and in most vegetables. Potassium is present even in acid fruits, thus exercising a buffer effect in the body in spite of the characteristic acid taste (see page 84). There is little danger of potassium deficiency.

The chief source of sodium is sodium chloride or common salt. Indeed other food sources of sodium may be disregarded as of

[1] Catalysts are chemical substances which cause other chemicals to combine, but do not enter into chemical combinations themselves, and can be recovered unchanged after the chemical action. Enzymes are organic catalysts of very complex structure which enter into all cell and tissue changes.

[2] White House Conference Report, *Nutrition*, p. 292, D. Appleton-Century Company, Inc., 1932.

[3] Osmosis is the process by which fluids of differing densities and compositions on opposite sides of an animal membrane, such as a cell wall or a capillary wall, tend to filter through the "semipermeable membrane" until the solutions are equalized.

little relative importance. Sodium exists in the body chiefly as sodium chloride. The "normal" or "physiological" salt ratio is referred to on pages 65–108. The affinity of salt for water is well known. In the body this characteristic is associated with normal osmosis of fluids and also with the retention of fluid in the tissues under certain pathological conditions known as "dropsy." In such conditions a salt-poor or salt-free diet may be prescribed. So important is the salt metabolism of the body, we are not surprised that a special regulatory mechanism is established for its control in one of the hormones of the posterior pituitary gland (see page 127). The maintenance of normal potassium-sodium balance is regulated by the adrenal cortex through the hormone cortin (see page 135).

Flesh-eating animals do not eat salt, while herbivorous animals require it, and will, in a state of nature, trek long distances to outcropping "salt licks." This need of salt to balance a vegetable diet is at least partly due to the high potassium content of vegetable foods, the potassium combining with the sodium in such a way as to remove it from the body, thus reducing—if carried too far—the normal salt ratio of the blood minerals. Salt is so very important to the chemical balance of the body that there would seem to be quite as much danger, if not more, in extreme salt reduction as in excess.[1] Moreover, nothing definitive has been found as to the relation between salt excess and the dropsy of nephritis, although reduction of salt is one means of relieving the condition. Salt metabolism has received relatively little conclusive study and one reads very conflicting statements and conflicting advice. The sane course is to avoid the excessive or unnecessary use of salt, and, on the other hand, not to enter a regimen of salt deprivation except under very expert medical advice. About two grams daily is required under ordinary conditions. There is certainly no justification for using salt to excess and forming the habit of salting everything, since any and every regulatory mechanism of the body may be overwhelmed by excessive work.

[1] Excessive sweating removes too much salt from the body fluids; this is one factor in heat prostration. Farmers give salt freely to farm animals in hot weather. Everyone should watch his salt intake when subjected to heat.

Chlorine enters the body in sodium chloride, and is used chiefly in the formation of hydrochloric acid, one of the important digestive fluids secreted by the gastric glands of the stomach, and in maintenance of the salt content of glands and cells. The acid glands of the stomach withdraw a fixed amount of chlorine from the blood stream and maintain the gastric acidity at a fixed concentration regardless of the amount of sodium chloride taken in food.

Iodine is another of the indispensable body minerals. Iodine is of such importance that one of the largest and most active of the endocrine glands, the thyroid, is devoted exclusively to the regulation of iodine metabolism (see page 128). As has been said, the animal body is essentially a marine organism (see page 103). Sea water contains a certain per cent of salt and of iodine. The first living protoplasm incorporated sea water in its colloidal meshwork and has maintained approximately this mineral ratio ever since. The original source of iodine was the sea, and a certain amount of iodine was left in the soil and rock when the sea receded. Inland water and vegetation accordingly contain iodine. In regions where the iodine has been leached out of the soil and thus out of the water and vegetation the symptoms of iodine deficiency abound among human beings and also in animals (see page 129). The role of iodine in body metabolism is basically concerned with growth, beginning in the early fetus, and is specifically concerned in the development of the brain and sex organs (see page 129).

There is a lack of authoritative information as to the danger of taking too much iodine, a question connected with the use of iodized salt. There is one opinion to the effect that no danger arises from its unnecessary use, and other opinion to the effect that it should be used with caution. Both are opinions, however, which will become replaced in time with conclusive evidence. In the meantime the prudent individual will neither avoid nor emphasize iodized salt as he will neither avoid nor emphasize common salt in his daily diet. The effect of iodine shortage is discussed on pages 69, 129, 130.

The richest sources of iodine are sea foods, such as salmon, cod, halibut, etc., and all vegetables produced from normal iodine-containing soil. Milk from animals eating sufficient iodine is also protective.

Sulphur enters into the structure of two of the essential amino acids, cystine and methionine (see page 71), and appears with nitrogen in most proteins. Sulphur has a detoxicating effect upon certain putrefactive products of food decomposition. Since sulphur is an essential constituent of proteins there will be no shortage in the diet if there is sufficient protein.

Silicon and fluorine are found chiefly in bone and teeth. Little is known as to their significance. Sherman suggests that, although regularly contained in the body, their presence may be due to their accidental intake, and that their deposition in the bones may be a mode of disposal rather than a utilization.[1] Silicon is abundant in hair and feathers, and has something to do with giving them rigidity. Fluorine is found in excess in the water of certain regions. In such regions the dental enamel of all young, human and animal, is affected by characteristic "mottling," which marks serious injury to the structure. These minerals are found in milk and in vegetable fibers.

Acid-base Balance.—As is mentioned elsewhere combustion of body fuels with the splitting out of certain acid-forming elements creates acid waste (see pages 74–80). This must be neutralized quickly or toxic acidosis will occur. The chemical mechanism for maintaining the fixed alkalinity of the blood (see page 108) and other tissues is complicated and involves, among other factors, the amphoteric quality of protein (reaction both to acids and to bases or alkaline salts). The blood proteins act as buffers (see page 71), together with bicarbonate and other buffer salts in the blood. The kidneys share in neutralizing acids by releasing ammonia and by the excretion of acid urine.

As we shall see (page 84) some foods contain minerals which produce acid reactions and some those which produce alkaline reaction. Fortunately the body can, to a large extent, regulate its use of these so as to maintain the precise chemical balance which has been said to be essential to health, *providing a sufficient proportion of both kinds of foods is supplied in the diet.* It is a great mistake to select the diet too exclusively from either class. The following table gives the reaction of some of the principal foodstuffs. It will be noted that a diet of meat, cereals, fats, and sweets would be strongly acid producing, while a diet exclusively

[1] SHERMAN, H. C., *Chemistry of Food and Nutrition*, p. 246, The Macmillan Company, 1932.

of milk, fruits, and bulky vegetables would be alkaline or basic. The most satisfactory diet from a standpoint of acid-base balance is one highly varied and selected from both groups of foods.

Acid-producing foods		Alkali-producing foods	
Foods	Total cc. of acid over base per 100 grams	Foods	Total cc. of base over acid per 100 grams
Bread	2.7	Almonds	12 38
Bread, whole wheat	3 0	Apples	3 76
Corn	5 95	Asparagus	81
Crackers	7.81	Bananas	5 56
Cranberries[1]	..	Beans, dried	23 87
Eggs	11 10	Beans, lima, dried	41 65
Egg white	5 26	Beets	10 86
Egg yolk	26 69	Cabbage	4 34
Fish, haddock	16 07	Carrots	10 82
Fish, pike	11 81	Cauliflower	5 33
Meat, beef, lean	13.91	Celery	7 78
Meat, chicken	17 01	Chestnuts	7 42
Meat, frog	10 36	Currants, dried	5 97
Meat, pork, lean	11 87	Lemons	5 45
Meat, rabbit	14.80	Lettuce	7 37
Meat, veal	13 52	Milk, cow's	2 37
Oatmeal	12 93	Muskmelon	7 47
Oysters	30 00	Oranges	5 61
Peanuts	3 9	Peaches	5 04
Prunes[1]	.....	Pears, dried	7 07
Rice	8.1	Potatoes	7.19
		Radishes	2 87
		Raisins	23 63
		Turnips	2 68

From McLester, *Nutrition and Diet*, pp 479–480, after Sansum, Blatherwick, and Smith.

[1] The ash of these articles is alkaline in nature, but because of the sources of hippuric acid contained in them, they increase the acidity of the body.

CHAPTER X

THE VITAMINS

The vitamins are chemical substances manufactured chiefly in plant organisms and sometimes called "plant hormones." (The animal seems to be able to manufacture or synthesize certain vitamins, notably vitamin A and vitamin D, provided certain "provitamins" are present.) These substances belong to the ever-increasing category of organic chemical compounds such as endocrine secretions, enzymes, and antibodies, of such potency that very minute amounts may produce exceedingly spectacular physiological effects.

The story of the discovery of vitamins[1] parallels in mystery and romance that of the discovery of the endocrines (see Chap. XIV) or that of the conquest of disease germs (see Chap. XVIII). Six vitamins have been isolated and are well known. Recent identification of a number of others is reported. The six original vitamins, A, B, C, D, E, and G, have been isolated and analyzed, and are now manufactured synthetically. The vitamins, like the food minerals, are found associated with the essential foodstuffs—proteins, carbohydrates, and fats—*as they are found in nature.* It cannot be repeated with too much emphasis that the animal body, having evolved under use of natural foodstuffs, rich in minerals and vitamins, still thrives best on a diet of foods in approximately their natural form. In discussing the balanced diet it is necessary to consider the vitamins and their sources, for, as in the case of minerals, it is easy in selecting commercially prepared food to omit important vitamins.[2] While it is undesirable to exceed the prescribed amount and ratio of food calories as provided in protein, fat, and carbohydrate, there is probably little danger of consuming too much of the vitamins. Sherman

[1] ROSE, MARY SWARTZ, *The Foundations of Nutrition*, Chaps. X to XV, The Macmillan Company, 1933.

[2] HAYHURST, EMERY R., *Personal Health*, pp. 54–59, McGraw-Hill Book Company, Inc., 1927.

says that there may be a distinct advantage in consuming fourfold the amount of vitamins necessary merely to prevent disease or signs of deficiency.[1]

Vitamin A. *"The Growth Vitamin," the Antixerophthalmia Vitamin.*—Vitamin A is essential to general growth. Food cannot be utilized in growth without the presence of vitamin A. In particular the normal functioning and the resistance of the structures of the eyes and of the respiratory, genitourinary, and digestive tracts to infections depend upon the presence of vitamin A in the diet during growth. Recently Mellanby of England reported extensive experiments upon dogs.[2] He concludes that the resistance mentioned depends upon the nutrition of the trophic (nutrition-regulating) nerve supply to the membranes, which depends, in turn, upon the presence of vitamin A. He found that prolonged deprivation of vitamin A produced degeneration of sensory cells and fibers, creating a condition in which there were deranged function and lowered resistance to germ invasion. Vitamin A is also indispensable to ovulation and reproduction.

Sherman believes that vitamin A is of particular importance during early life, asserting that subsequent deficiency has much less effect upon experimental animals and upon children who have had abundant vitamin A during early growth. He says that the susceptibility to infections of children at ten to twelve may depend upon the way they were fed before three.[3] According to Mellanby's findings the explanation is the advantage of having developed a strong, normally functioning nervous system, particularly the portions concerned in nutritional control of the mucous membranes of the body (see page 221).

Vitamin A is synthesized from the provitamin carotene and stored in the animal body, apparently in the liver. It appears that the yellow pigment carotene (also called carotin; see page 87) must be present, or the vitamin cannot be manufactured. The richest sources of vitamin A are certain animal foods, butter

[1] SHERMAN, H. C., *Food and Health*, pp. 116–117, The Macmillan Company, 1934.

[2] MELLANBY, EDWARD, *Nutrition and Disease: The Interaction of Clinical and Experimental Work*, Chap. V, Oliver and Boyd, London, 1934.

[3] SHERMAN, H. C., *Chemistry of Food and Nutrition*, p. 351, The Macmillan Company, 1932.

fat, cream, full cream cheese, and egg yolk; also liver, cod liver oil, and haliver oil. The richest sources of carotene are yellow vegetable foods such as carrots, sweet potatoes (not white potatoes), yellow corn (not white corn), yellow turnips, squash, etc. Carotene is also found in green leaves, although the yellow pigment is covered up by the green chlorophyll. Carotene is manufactured prodigally in nature but the trick of its conversion into vitamin A is still a mystery.

The importance of abundant vitamin A in the body is becoming increasingly obvious, especially for the growing years, when the nervous system and the associated structures are assuming final form.

A good deal is being written about vitamin A as a preventive and cure for colds and other respiratory infections.[1] There seems to be no doubt that a generous provision of food with vitamin A value is essential to normal resistance and furnishes a rational basis for any curative regimen. In a case of previous deficiency, particularly if long continued and especially if existing during childhood, it is probably expecting the impossible to look for a sudden and miraculous resistance to colds on the ingestion of a quantity of vitamin A (see page 221).[2]

Vitamin B. *"The Appetite Vitamin," the Antiberiberi Vitamin.* Vitamin B originally included vitamin G or B_2, which was separated from the "Vitamin B Complex" in 1928. Vitamin B or B_1 also is essential to growth and nutrition and to nerve function but for reasons different from vitamin A. In young children and in experimental young animals deficiency of vitamin B shows first in loss of interest in food, rapid loss of weight, loss of strength, and mental apathy. Under continued deprivation, in both adults and young, a variety of marked nervous symptoms appear, which may go on to complete paralysis and death. The medical term for the typical complex of extreme deficiency is beriberi (in man) or polyneuritis (in birds). Experimental animals refuse to eat under vitamin B deficiency, and forced feeding results in the

[1] SHERMAN, *Chemistry of Food and Nutrition*, p. 351.
SHERMAN, *Food and Health*, Chap. XII.

[2] CLAUSSEN, S. W., "Nutrition and Infection," *Journal of the American Medical Association*, Mar. 9, 1935; Editorial, "Nutrition and Resistance to Infection," *Journal of the American Medical Association*, Sept. 29, 1934.

food's lying undigested in the crop or stomach. In experimental dogs appetite has been restored by the intravenous injection of vitamin B.

In this country extreme deficiency or beriberi is seldom seen except in experimental animals. There seems to be no doubt, however, that much poor appetite, malnutrition, and dullness among growing children and much digestive disturbance, extreme constipation, appendicitis, nervous trouble, and general debility in adults are due to insufficient vitamin B in the diet.

One of the functions of vitamin B is to regulate the oxidation of food fuel (glucose) in the brain and midbrain throughout the lactic acid stage. Deficiency causes apathy, paralysis (beriberi), etc., which may clear up within a few hours on administration of vitamin B. In long-continued cases, where the sheaths of the nerves have become injured, recovery is much more slow, being a matter of weeks or months, and, of course, in extreme conditions, impossible. (Mellanby thinks vitamin A deficiency is also involved in typical beriberi.[1])

Reproduction, lactation, and general glandular activity are impaired in vitamin B deficiency. The pancreas, thyroid, adrenals, and sex glands all undergo structural changes.[2]

Vitamin B is widely distributed in nature and is short in the human diet only when there is disproportionate consumption of foods which have been deprived of vitamin B, such as white flour, concentrated sugar, starches, and fats. Milk is only moderately rich in vitamin B—one reason children, even infants, should receive a variety of foods. The richest natural source is seed germs and brewer's yeast; water cress and other green leaves are rich in vitamin B. The free use of whole-grain breads and cereals, together with an abundance of fresh vegetables, will safeguard the individual. Vitamin B is particularly important in the diet of persons ill from fevers, or from disturbances of the digestive tract, and in the diet of nursing mothers.

Vitamin B has been isolated in the form of a crystalline salt, and various concentrates are available. Except in special situations it is much better to eat a generally balanced ration than it is to depend upon taking artificial concentrates.

[1] MELLANBY, *op. cit.*. Chap. VI, "The Problem of Beriberi."

[2] ROSE, *op. cit.*, p. 281.

Vitamin C. *"The Dental Vitamin," the Antiscorbutic Vitamin.* Vitamin C is essential to general growth and vigor, and is concerned in the growth and health of the teeth and their surrounding tissue, hence the term "dental vitamin." Vitamin C seems to be involved, along with cortin, the hormone of the adrenal cortex (see page 136), in preserving the sodium-potassium balance within the body fluids and tissues. Extreme deficiency produces scurvy, a disease marked by joint pains, capillary hemorrhage, loss of strength, sallow color, and especially by specific changes in gums and dental sockets. The teeth become loose and drop out. Eating is difficult. The odontoblast cells in the pulp of the tooth, which convey nutrition to the dentine (body of the tooth), are first affected.[1] There is degeneration of cartilage cells all over the body, and weakening of capillary structure such that hemorrhages easily occur. The appetite is poor and the general immunity to infections is lowered. Extreme cases are now rarely seen, but moderate deficiency is believed to be a large factor in the greater prevalence of dental decay and general lack of vigor among poorly fed children and adults.

Recent research seems to prove that vitamin C is a special form of hexuronic acid, a substance which closely resembles cortin, the hormone of the adrenal cortex. A synthetic substance known as *cevitamic acid* is now being used in treatment of vitamin C deficiency. Vitamin C is now said to be stored in the adrenal cortex and in less concentration in the skin. Vitamin C, copper, and pigment seem to be interrelated in the skin.[2]

Vitamin C is the most readily destroyed of all the vitamins. It is quickly destroyed by heat in the presence of oxygen or alkali. Milk, vegetables, or other foods heated in a vacuum lose little of their vitamin C. Prolonged heating of milk in pasteurization is more destructive of vitamin C than the quick or "flash" boil now commonly used in preparing infants' milk. Also, if the raw milk is placed in the nursing bottles and sealed before heating the loss is much reduced.

Cow's milk varies greatly in its vitamin C concentration according to the diet of the cow. It is always relatively poor, hence the

[1] *Ibid.*, p. 309.

[2] CORNBLEET and PACE, Exhibit at the meeting of American Medical Association, May, 1936.

present emphasis upon early giving of orange juice and tomato juice, especially with artificially fed infants.

Orange juice contains the highest concentration of Vitamin C of any known food substance; next comes grapefruit juice, lemon juice, then vine-ripened tomato juice, new cabbage, and green lettuce. The tuberous vegetables contain little vitamin C; old carrots practically none, new carrots a little. Potatoes have low concentration but have protective value because of the large amounts commonly eaten. Meat contains very little. Stefansson and his men, it is true, did not contract scurvy on a long-continued diet of meat. Their meat was for the most part, however, eaten raw without being drained of blood, the liver and other glands were also eaten, and in the aggregate they obtained a sufficient amount of the vitamin. There is no vitamin C in seeds, but the sprouts of seeds to which nothing has been added except water and exposure to light and air, will be rich in vitamin C, indicating that there must be some yet undiscovered provitamin (see page 86).

Eggs contain no vitamin C, neither do prunes. This fact should be remembered in infant feeding, since mothers often consider prune juice an equivalent substitute for orange juice.

Modern dentists are stressing vitamin C in the treatment of dental caries (decay). A stock prescription is one pint of orange juice, the juice of one lemon, and half of a head of lettuce daily. It is said that the decay often becomes arrested and the mouth tissues return to normal with spectacular promptness providing always that the diet is otherwise satisfactory.

Vitamin D. *"The Sunshine Vitamin," the Antirachitic Vitamin.* Vitamin D in cooperation with parathormone from the parathyroid glands (see page 130) and certain hormones from the anterior pituitary (see page 126), regulates the utilization and absorption in the body of calcium, phosphorus, and possibly magnesium (see page 78). Even with sufficient phosphorus and calcium, an inadequate supply of vitamin D will cause infants to contract the well-known and highly prevalent disease rickets. In adults vitamin D shortage may produce nervousness and the disease osteomalacia, which is characterized by softening of the bones.

Vitamin D is manufactured in both plants and animals through the activation of a sterol (see page 75; ergosterol in the animal, phytosterol in the plant) by ultraviolet rays in sunshine. These rays are also produced in high concentration by carbon-arc lamps and mercury-vapor quartz lamps. The *provitamin ergosterol* is found in most tissue cells but especially in the skin. It seems certain that vitamin D is manufactured wherever the ultraviolet ray impinges upon ergosterol. Thus one may manufacture his own vitamin D by permitting the sun or an ultraviolet lamp to shine upon his skin, or he may eat foods or concentrates containing vitamin D. The safest plan, at least in the temperate zone, where there are many obstructions to the free passage of sunlight, is to use both methods.

There is some storage of vitamin D in the liver, but the extent depends so directly upon diet that we seem still to lead a hand-to-mouth existence, requiring a fairly steady supply of vitamin D food, or steady stimulus to create it. Vitamin D is found in protective amounts in egg yolk, in fish liver, fish oil, particularly liver oil, in the flesh of both salt-water and fresh-water fish, but in higher concentration in salt-water fish. Vitamin D is probably widely distributed among fresh natural foods in small amounts, and it has lately been found present in milk and cream and green leaves to a slight extent. Sherman says, "The very significant, though variable, importance of milk as a source of vitamin D has been only recently established, so that conflicting statements regarding the antirachitic value of milk still occur even in the writings of high authorities."[1] It appears that the methods of determining the presence of vitamin D have, until recently, registered only relatively high antirachitic values.[2] Recent reports state that several vitamins, variously stated as 3 to 8, have been separated from vitamin D in the laboratory. One of these has been crystallized and named *calciferol.*

At the present time available concentrated vitamin D in food form is chiefly confined to egg yolk, cod-liver oil and haliver oil (both of which oils contain important amounts of vitamin A), and

[1] SHERMAN, H. C., *Food Products*, p. 37, The Macmillan Company, 1933.

[2] "Do Common Foods Contain Vitamin D?" *Journal of the American Dietician Association*, January, 1936.

viosterol (made from irradiated ergosterol obtained from ergot or yeast). Viosterol contains no vitamin A. Some use is being made of calciferol as a substitute for food concentrates.

Vitamin E. *"The Reproductive Vitamin," the Antisterility Vitamin.*—Vitamin E, like vitamins A and D, is fat soluble. It seems to be stored in the tissues. Its relation to growth and nutrition in the young is not clear, but it is indispensable to reproduction and to growth of the fetus. Experimental young rats thrive under a balanced diet lacking only vitamin E. They mature and breed, but the placenta seems unable to develop and the young are lost. Vitamin A is equally essential to reproduction, but in vitamin A deficiency the female animal does not ovulate or conceive normally.

Vitamin E is most concentrated in seed germs, notably in wheat-germ oil. It is widely distributed throughout animal and vegetable foods. There is yet uncertainty as to the role of vitamin E in human reproduction, but owing to its prevalence there is little possibility of shortage in the human diet.

Vitamin G. *"The Poor Mans Vitamin," the Antipellagra Vitamin.*—Vitamin G was separated from the vitamin B complex in 1928 (see page 87). It is sometimes called "the poor man's vitamin" because low-cost dietaries, unless very intelligently planned, are apt to be deficient in it. Vitamin G seems to be indispensable to growth and to normal nutrition at all ages. Deficiency produces symptoms, according to the degree of deprivation, ranging from mild or moderate digestive disturbance, arrest of growth, susceptibility to infections, weakness, and nervous depression, to extreme degrees of these conditions together with the characteristic skin lesions of pellagra.

Vitamin G is found in yeast, glandular organs, lean meat, fish, milk, eggs, young green vegetables; in lesser amounts in bananas, citrus fruits, carrots, and tomatoes.

CHAPTER XI

OTHER ASPECTS OF THE DIET

Aye, and the body, clogged with the excess
Of yesterday, drags down the mind no less
And fastens to the ground, in living death,
That fiery particle of Heaven's own breath.
HORACE

Water.—As explained in pages 20–22 water plays an exceedingly important role in the human body, furnishing, as it does, the solvent or medium for the body chemistries which constitute life itself. "Every substance that is distributed through the body is carried either in solution or in suspension. . . . Water is not a mere passive constituent of the human body. Certain of its functions are of a spectacular sort."[1] Water is the chief regulator of body temperature; it sustains blood volume (page 110); it carries the lubricating medium which protects joints and fills the bursae (lubricating pockets) between muscles; it cushions the brain and spinal cord as cerebrospinal fluid; and it conveys waste products to the exterior of the body.

The endocrine secretions share in regulating the water activities of the body, although just how these operate is not well understood. It is certain that the posterior pituitary (see page 127) plays an important role. Impairment of the thyroid, Islands of Langerhans, or parathyroids also disturbs water balance, particularly as shown in urinary excretion.

The exact water requirement of the body in any individual under any given set of conditions is difficult to compute. There is the greatest need for conclusive investigation of the many aspects of water metabolism, especially since so many and varied and dogmatic opinions find their way into treatises on hygiene and health. Thirst (see page 104) is nature's guide in the matter of

[1] White House Conference, *Nutrition*, p. 324, D. Appleton-Century Company, 1932.

water consumption, but so many artificial conditions have been introduced into the eating experiences of the human being that his thirst sense, like his hunger sense, cannot always function accurately. Some of the factors of variation influencing water need and thirst are air temperature and, still more, humidity; clothing; activity; water content of foods; presence of salt or sugar in food; thoroughness of chewing.

There is probably far less danger of drinking too much than of drinking too little water. At the same time there would seem to be no necessity for making a fetish of drinking just "so many" glasses of water daily. There are a few common-sense rules which everyone should observe, and which, in the normal individual, are probably sufficient to insure normal water intake. First, avoid foods that are too sweet or too salty. There are other fully sufficient reasons for this avoidance (see pages 74–81). Second, chew all food thoroughly in order that it may receive the full benefit of salivary digestion (see page 56), and do not drink until each mouthful has been chewed and swallowed. It is perhaps better to form the habit of eating so slowly and chewing so thoroughly that one does not need to drink until the end of the meal. Third, one should particularly avoid forming the habit of putting off drinking because it is inconvenient to secure water when one is thirsty. Such neglect is best prevented by establishing habits of drinking water at certain convenient times. Immediately after rising is one good time; in the case of the student, to drink when one's regular line of march passes a drinking fountain is a good practice. The last thing at night may be a convenient time, particularly if one's daily routine is not favorable to regular drinking. The extreme importance of adequate water intake for the sick is discussed on pages 113, 310.

Substances Consumed for Pleasure Rather Than for Food.—It is difficult to account for the propensity of the human animal to eat and drink substances having no food value, which do not enter into or contribute to the normal chemical activity of the body cells.

Condiments, spices, flavors should be used in moderation. One should cultivate a liking for simple, wholesome dishes, and eat a sufficient variety of well-cooked foods, so that he does not require high seasonings to lend interest to eating. The use of such acces-

sories arose in part from the use of salt and spices as preservatives, but chiefly from the necessity for creating attractiveness and variety in taste when it was necessary to use basic foods such as grains and seeds to a highly monotonous extent, especially during long winter seasons.

Candy, soft drinks, etc., have been discussed under carbohydrates, page 74.

Beverages.—Tea, coffee, and cocoa, contain stimulant (caffeine and theobromine), and all commonly provide a vehicle for sugar. In the case of the adult who does not permit the use of tea and coffee to curtail his daily milk quotient and who uses them only to a moderate extent, to which his body accommodates fully, there is probably little to be said. The body has vast capacity for accommodation *to the habitual.* This capacity varies greatly in different individuals. One man's meat may be literally another man's poison. Cocoa, while possessing some food value which tea and coffee do not, is unpalatable unless highly sweetened. It contains a stimulating principle similar to that in tea and coffee and is habit forming. These are sufficient reasons for carefully avoiding its habitual use, especially with young children.

Alcoholic Drinks.—The use of fermented drinks is a purely artificial custom. The human animal body has not evolved in the presence of fermented foods or narcotics, and therefore has not built up regulatory and protective mechanisms as it has for the food substances that enter into the natural or normal diet. Herein lies the great danger. *There is no mechanism of satiety to cause one to stop as there is in the case of natural foodstuffs.* The use of alcoholic beverages goes back as far as recorded history. Their use involves such far-reaching industrial, economic, social, eugenic, and health consequences that the question "to use or not to use" should be settled by each individual, particularly the young individual, only after very serious consideration.

The reason for the very general appeal of such drinks resides partly in the pleasurable physical effect of moderate amounts and very largely, at the present time, in the contagiousness of social custom—the fact that it is the "swanky" thing to drink cocktails and go to night clubs where social drinking is carried to excess. The young person leaving home to assume responsibility for his own conduct and career should take a long-time view of the

matter with quite detached perspective and weigh the pros and cons, physical, mental, and economic.

THE PHYSICAL AND MENTAL EFFECTS OF ALCOHOL.—From a purely physiological point of view alcohol is a very important and interesting substance. In one way or another alcohol may affect the function of every organ of the body. Its most important influence, however, is exerted on the brain. Alcohol, when taken into the mouth usually as an ingredient of beverages, is readily absorbed from the digestive tract and rapidly enters the blood stream. In this manner the organs of the body become bathed in blood containing alcohol. The organs then take up alcohol from the blood and this alcohol continues to exert its effects on the various organs until it is completely oxidized or excreted.[1]

In other words, alcohol is rapidly absorbed from the digestive tract and is slowly but completely oxidized in the tissues. Alcohol is exceedingly volatile and will be absorbed even from fumes. It appears in the blood within a few minutes after taking. The maximum concentration is found within one-half to two hours, the time required, according to the amount taken, for the ingested alcohol completely to leave the intestinal tract. If another drink is taken before the complete absorption of the previous one the effect is intensified. The cerebrospinal fluid is found to have about the same concentration of alcohol as the blood. Alcohol is eliminated in the average healthy adult body at about the rate of 2 cubic centimeters per hour. Only about 1 to 2 per cent is eliminated by breath and urine and none by perspiration. An average man will eliminate about one pint of proof spirit in 24 hours.[2] The "hang-over," headache, and wretchedness following copious drinking, are due in part to the acidosis resulting from narcotization of the respiration centers controlling elimination of lactic acid from the tissues.

Alcohol is classed as a narcotic because it is capable of producing unconsciousness. It always acts as a depressant or inhibitor upon the brain and nervous system and—contrary to popular belief—*never as a stimulant.*

[1] EMERSON, HAVEN, and others, *Alcohol and Man*, p. 1, The Macmillan Company, 1933.

[2] EMERSON, HAVEN, *Alcohol, Its Effects on Man*, p. 25, D. Appleton-Century Company, Inc., 1934.

A depressant generally or selectively reduces one or more of our body functions by virtue of its capacity to reduce their strength, speed, or quality. Alcohol in all strengths and in practically all experimental and so-called natural conditions can be shown to exert a depressant effect on the tissues of the nervous system. This is its dominant and almost exclusive action, and it is for the effects thus created that it is used as a beverage and prescribed as a drug, all other actions being secondarily related to its primary depressant effects.[1]

The chemistry of the depressant or narcotic effect of alcohol is not entirely clear. It is known that alcohol causes the production in the tissues of an increased amount of lactic acid with decreased oxidation. The entire process, however, "is probably the expression of deep-seated chemical changes involving perhaps the water content of the protoplasm which constitutes the cells of the body."[2]

Alcohol produces a sense of well-being by virtue of causing one to become less acutely aware of reality. He forgets his cares and worries and sheds his subjection to the conventions and responsibilities of life. Under this condition of "suspended judgment" any one may commit crimes, even murder, and may become abusive, cruel, and totally changed in personality. Continued ingestion leads to complete narcotism, the condition of being "dead drunk." Always one's judgment becomes dulled; his nervous coordination and sense of discrimination less accurate. It has been fully demonstrated by numberless experiments that alcohol in any amount depresses the mental and sensory functions of the brain. The individual becomes at once less able to discriminate among stimuli, the fingers do not move so rapidly or so accurately. The subject does not recognize the change, as he also loses his keenness of perception. It is on this ground that alcohol is rigidly prohibited athletes and all persons employed in skilled and mechanical industries.

One of the first subjective symptoms is a sense of warmth accompanied by filling of the superficial capillaries. This is a fictitious warmth, however, caused by the depression of the vaso-dilator mechanism, and is accompanied by a lessened supply of blood to vital organs. The heart beats more rapidly because

[1] *Ibid.*, p. 15.

[2] EMERSON, *Alcohol and Man*, p. 16.

the vagus or inhibitory nerve which regulates the heart is depressed. Swientochowski believes alcohol in large doses causes widening of the capillaries in all parts of the body with lowered blood pressure in spite of the rapid heart, and thinks that even moderate doses of alcohol interfere with the heart's action and injure the heart muscle.[1] Taking alcohol, therefore, before or during exposure to cold is a mistake, since it increases heat loss, and the feeling of warmth is temporary and deceptive.

Continued consumption of alcohol leads to a great variety of possible alcoholic poisonings or toxemias. The variety is doubtless due to the fact that each human body has its own points of least resistance. Thus one person may contract a chronic catarrh of the entire digestive tract; another may have fatty degeneration of the heart and sclerosis (hardening) of the blood vessels; many undergo cirrhosis and degeneration of the liver. In many cases, with or without the gross degenerative changes described, mental changes occur, beginning with the gradual disintegration of personality and continuing to permanent softening of brain tissue, and meningeal thickening accompanied by delusional insanity. Hemorrhage of the brain and apoplexy may occur.

Delirium tremens is a state of maniacal excitement which may come on suddenly during protracted drinking, particularly in case of imposed mental or physical shock. The delirium is characterized by acute fear and horrible hallucinations, and terminates, usually within a few days, in the sleep of exhaustion or in death.

Users of alcohol who go beyond occasional moderate partaking show, on the average, shorter life span than abstainers and occasional users. The life span is definitely shortened, as shown by life insurance and other authentic statistical tables, in direct proportion to the amount used.

While resistance to infection does not seem to be specifically affected by alcohol, the *capacity for recovery* may be definitely lowered.[2]

Though alcohol, except in extreme excess, does not impair the ability to produce offspring, there is in the immediate generations a distinct impairment in quality of young and in the rate of

[1] *Ibid.*, p. 18.
[2] *Ibid.*, Chap. VIII.

survival. Stockard and others[1] found that the quality and survival of progeny were impaired through several successive generations of experimental animals, whereupon a surprising thing happens: apparently all the weak germ plasm has been selectively used up and one or more generations of superior stock may appear.

On the whole it is difficult to look at the picture spread before us by science or society and see much inducement or justification for deliberately contracting even the cocktail habit. Surely no normal young person can ever look upon the degrading spectacle of a charming young couple as they pass through the stages of silliness, indiscretion, staggering, maudlinism, "being sick," to "passing out" in utter brutishness, and can elect to surrender his or her own self-respect in like manner. It is difficult for an onlooker to see wherein the "fun" lies. Even the feeling of escape from care and of increased well-being which briefly accompanies moderate drinking carries some measure of reaction, and there is the ever-present danger of passing the stage of inhibitory control. The use of alcoholic beverages is not so much a matter of morals as it is of good manners, good taste, and common sense.

Tobacco.—It is impossible in any comprehensive discussion of body chemistry and human nutrition under present-day conditions to avoid consideration of tobacco. Since women have taken up smoking the manufacture and consumption of cigarettes in this country have become phenomenal in extent, reaching in 1928 the appalling total of 106 billion cigarettes. It is impossible to determine the effect of this upon the health and well-being of the public. It will be necessary to observe at least one generation of smoking women, and necessary to devise conditions of controlled research, before it will be possible to state really conclusive and scientific findings.

The appeal of tobacco, like that of alcohol and the other narcotics, is due to the sense of well-being, escape from reality, and general relaxation induced by its use. The effect of nicotine (the active principle of tobacco) upon the nervous system is first stimulating, then paralyzing. "From the anatomical standpoint prolonged poisoning from tobacco causes chronic inflammation

[1] STOCKARD, C. R., *Physical Basis of Personality*, W. W. Norton & Company, Inc., 1931.

and ultimate sclerosis of the nervous elements, exactly as in the case with alcohol."[1]

There is some evidence that the initial stimulation may be due to speeding up the secretion of adrenalin (see page 136), thus temporarily increasing the energy quotient of the body.[2]

It appears that young organisms are much more markedly affected than adult. It is well known that the use of tobacco arrests growth, injures the heart, and is generally toxic to growing children; hence the very sane traditional rule that the boy shall not smoke until he is twenty-one, then he may decide for himself.

Some fifteen years ago a committee of 50 prominent medical and scientific men representing the leading countries of the world was appointed "to study the tobacco problem." They collected and studied all the available literature and reports of research upon the subject and brought together an analysis of some 850 titles. In the preface Dr. Henri Vaquez, a cardiac (heart) specialist of the Academy of Medicine in Paris says,

> If the experiments to determine the effects of tobacco have not been conclusive, they have at all events given us a knowledge of nicotine, a substance whose toxic influence upon the heart is very remarkable; and that knowledge is something worth having. It appears that tobacco cannot be freely indulged in without injury to the normal action of that organ. . . . In this respect it is beyond doubt that in young persons an excessive use of tobacco quickly induces disturbance of cardiac rhythm, due in all probability to their greater sensitiveness to the poison.[3]

Rosenau says,

> Tobacco smoke is a very complex mixture. It contains carbon monoxide, hydrocyanic acid, ammonia, nicotin, pyrodin, and their derivatives, tar and resinous compounds, etc. Nicotin is carried in the smoke in a suspended state. There is as much as 0.57 per cent nicotin in the smoke of cigarettes, much of which is absorbed. There is a retention as high as 66.7 per cent in puffing, and 88.2 per cent in inhaling.[4]

[1] SCHRUMF-PIERSON, PIERRE, *Tobacco and Physical Efficiency*, Report of the Committee to Study the Tobacco Problem, p. 10, Chap. III, Paul B. Hoeber, 1927.

[2] HAGGARD and GREENBERG, "Tobacco and the Adrenals," *Science*, February, 1934.

[3] SCHRUMF-PIERSON, *op. cit.*, p. xi.

[4] ROSENAU, MILTON J., *Preventive Medicine and Hygiene*, p. 470, D. Appleton-Century Company, Inc., 1931.

Apparently there is greater absorption from inhaling than from mere puffing. Smoker's laryngitis occurs chiefly in inhalers. "Smoker's asthma" may occur from depression or paralysis of the breathing centers. "Smoker's dyspepsia" may occur from inhibition of the salivary and digestive glands.

There is conflicting and uncertain evidence as to the effect of tobacco upon reproduction. Unfortunately experimental animals and human beings are not affected in the same way, and complicating factors have not been ruled out of the reported situations. It is known that nicotine will appear in human milk under excessive smoking, although nature has protected the child by making it well-nigh impossible for ingredients other than those contained in normal milk to pass the glandular lacteal mechanism. Sterility, menstrual irregularities, and miscarriage are reported among women tobacco workers, but these occur less frequently in factories in which hygienic and seating conditions are satisfactory. There are at present no controlled data as to the effect of moderate or excessive smoking upon the reproductive functions. As stated before, the fad is still new and there has not yet been time for authentic observation.

One is quite safe in asserting that the use of tobacco is entirely unnecessary; it is expensive; it entails a certain amount of known hazard of injury to the organic functions of the body. Like any drug habit it becomes tyrannical. The nervous system, making what shift it can to accommodate to the situation, lets the user down most terribly if he misses his accustomed dose. The condition is unnatural and disturbing and sometimes very inconvenient. Again the dispassionate onlooker wonders "Why?"

References on Foods and Nutrition

Bogert, L. Jean: *Nutrition and Physical Fitness*, W. B. Saunders Company, 1931.

———: *Diet and Personality*, The Macmillan Company, 1934.

Cannon, W. B.: *Wisdon of the Body*, W. W. Norton & Company, Inc., 1932.

Hayhurst, Emery R.: *Personal Health*, McGraw-Hill Book Company, Inc., 1927.

Howell, W. H.: *Textbook of Physiology*, W. B. Saunders Company, 1931.

McCollum, E. V.: *Newer Knowledge of Nutrition*, The Macmillan Company, 1935.

McLester, James S.: *Nutrition and Diet*, W. B. Saunders Company, 1928.

Mellanby, Edward: *Nutrition and Disease*, Oliver and Boyd, London, 1934.

ROSE, MARY SWARTZ: *The Foundations of Nutrition*, The Macmillan Company, 1933.

ROSENAU, MILTON J.: *Preventive Medicine and Hygiene*, D. Appleton-Century Company, Inc., 1931.

SHERMAN, H. C.: *Chemistry of Food and Nutrition*, The Macmillan Company, 1932.

———: *Food Products*, The Macmillan Company, 1933.

———: *Food and Health*, The Macmillan Company, 1934.

White House Conference: Nutrition, D. Appleton-Century Company, Inc., 1932.

References on Alcohol and Tobacco

BILLINGS, J. S., and others (The Committee of Fifty): *Physiological Aspects of the Liquor Problem*, Houghton Mifflin Company, 1903.

DODGE and BENEDICT: *Psychological Effects of Alcohol*, Carnegie Institution of Washington, 1915.

EMERSON, HAVEN: *Alcohol: Its Effects on Man*, D. Appleton-Century Company, Inc., 1934.

EMERSON, HAVEN, and others: *Alcohol and Man*, The Macmillan Company, 1933.

HAYHURST, EMERY R.: *Personal Health*, McGraw-Hill Book Company, Inc., 1927.

HOWELL, W. H.: *Textbook of Physiology*, pp. 971–975, W. B. Saunders Company, 1931.

MENDENHALL, W. L.: *Tobacco*, Harvard Health Talks, Harvard University Press, 1930.

MILES, W. R.: *Alcohol and Human Efficiency*, Carnegie Institution of Washington, 1924.

O'SHEA, M. V.: *Tobacco and Mental Efficiency*, The Macmillan Company, 1923.

ROSENAU, MILTON J.: *Preventive Medicine and Hygiene*, pp. 515–521, D. Appleton-Century Company, Inc., 1931.

SCHRUMF-PIERSON, PIERRE: *Tobacco and Physical Efficiency*, Report of the Committee to Study the Tobacco Problem, Paul B. Hoeber, 1927.

STARLING, HUTCHINS, MOTT and PEARL: *The Action of Alcohol on Man*, Longmans, Green & Company, 1923.

STOCKARD, C. R.: *Physical Basis of Personality*, W. W. Norton & Company, Inc., 1931.

CHAPTER XII

THE FLUIDS OF THE BODY

> We ordinarily speak of ourselves as air-inhabiting animals. A little reflection will disclose, however, the interesting fact that we are separated from the air which surrounds us by a layer of dead or inert material. The skin has an outer covering of dry and horny scales (which may, of course, at times be wet with sweat), and the surfaces of the eyes and the inner parts of the nose and the mouth are bathed in a salty water. All of us that is alive, the vast multitudes of minute living elements or cells which compose our muscles, glands, brain, nerves and other parts, reside within this surface coat of non-living stuff. And, except their sides where they are contiguous one with another, the cells are in contact with fluid. The living elements of the body, therefore, are water inhabitants, or inhabitants of water which has been modified by the addition of salt and thickened by an albuminous or colloid material. In order to understand the significance of this water environment or fluid matrix, we must inquire into the services it performs and how it performs them.[1]

The Fluids of the Body.—Attention has been called in Chap. III to the fact that the land animal is, actually, a salt-water animal who carries his fluid environment around with him in a sac of skin. Whereas the one-celled animal lives in a medium of stagnant water or sea water which is highly impregnated with minerals and nutriment, and by osmosis through its surface absorbs nutritive substances and oxygen and gives off waste, the multiple-celled animal, particularly the dry-land animal, has had to evolve a very complex mechanism for bringing its various cells into contact with nutriment in fluid form as dissolved in the universal solvent water, and into contact with air that it may obtain oxygen, the agent of combustion for the energy fuels. Body fluids are found in four forms: (1) cell fluid; (2) specific chemical fluids; (3) circulating fluids, blood and lymph; (4) fluid wastes, urine and perspiration.

1. *Cell fluid* is found within tissues *adsorbed* or adherent to the surfaces of the spongy colloids constituting the cell framework

[1] CANNON, W. B., *The Wisdom of the Body*, p. 27, W. W. Norton & Company, Inc., 1932.

(see page 21). The various tissue cells contain varying amounts of "bound water" or "living water"; the more active the tissue, the greater the amount of chemical solution which will be found within its colloidal meshes. The blood plasma consists of 90 per cent of water; the brain cells, which must perform chemical reactions "as quick as a thought," consist of 85 per cent of water; saliva, which constitutes an important fluid regulator of the body, is almost 98 per cent water. Bone, an inactive, static tissue, contains little water.

The "living water," mentioned as found within the cells themselves, constitutes the greater part of the body fluid. Approximately 60 per cent of the body weight is cell water, and about 6 per cent is blood and lymph, of which there is approximately 6 quarts in an average adult body. This leaves about one-third of the body weight to be accounted for in tissue-cell framework, mineral deposits, and fat—these solids being found in bone, muscle, glands, etc.

2. *Specific Chemical Fluids.*—A number of specific chemical fluids are manufactured within the body and not only perform their particular functions but, thriftily, assist also to maintain the fluid balance of the body.

SALIVA is manufactured within the parotid, sublingual, and submaxillary glands. Saliva not only lubricates the food mass for swallowing and partially digests carbohydrates through its enzyme, ptyalin (see page 56); it also performs a continuous office in thirst regulation, since at least part of the sensation of thirst is due to lessened secretion of saliva with drying and concentration of saliva on the mucous membranes at the back of the mouth. It is said that the salivary glands of an adult man secrete 1½ quarts of saliva daily, most of which flows insensibly down the throat when there is no food in the mouth and which assists in keeping the contents of the stomach and bowel at a normal consistency.

GASTRIC JUICE, PANCREATIC JUICE, AND BILE.—In addition to the saliva, the gastric glands of the stomach manufacture approximately 2 quarts of "gastric juice" daily, and the gall bladder and pancreas pour, during 24 hours, an additional 1 to 2 quarts of fluid into the bowel. Thus, we see, the internal exposed surface of the body tissues is constantly bathed in a very specific and copious fluid medium.

Nature, who ever works toward thrift, causes much of this fluid to be reabsorbed from the intestinal wall. It is said that some water is even retrieved by reverse filtration from the kidney tubules after the waste products have been extracted from the blood in the capillaries within the glomeruli of the kidneys.[1] If

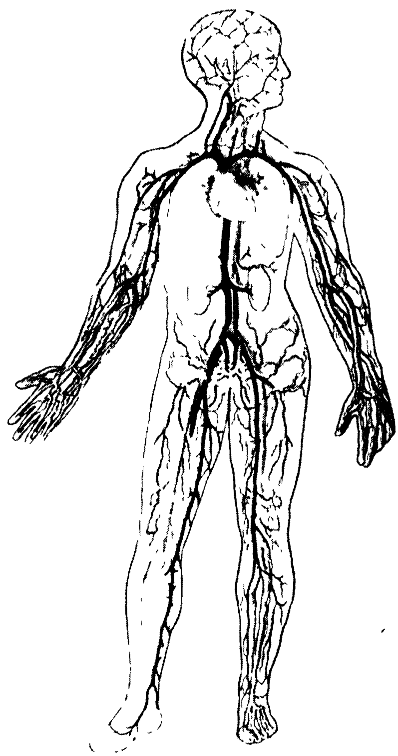


Fig. 41.—The circulatory system. (*American National Red Cross Chart* III, *P. Blakiston's Son & Company.*)

these conditions did not obtain we should have to drink a truly enormous quantity of water, and shortage for even a few hours would be serious.

The mucous and serous secretions and cerebrospinal fluid lubricate and fill all cavities and surfaces of contact within the body and constitute a considerable amount of fluid which must

[1] Cannon, *op. cit.*, p. 82.

continually be renewed and kept constant in chemical composition.

3. *Blood and lymph* are the circulating fluids of the body. Blood is found circulating ceaselessly through a closed system of tubes into which an automatic heart pump is inserted for the purpose of keeping the fluid moving. (Figs. 41, 42). The lymphatic system operates in a one-way stream leading from the body tissues toward the point where the lymphatic ducts empty into the large veins above the heart.

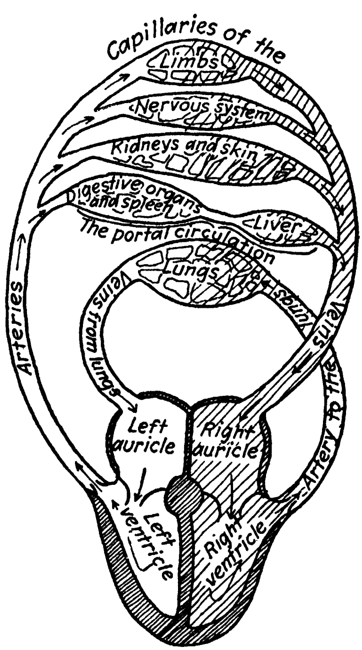


FIG. 42.—Diagram of the circulatory system (modified). (*Eddy, A Text-book in General Physiology and Anatomy, American Book Company.*)

THE LYMPH exudes by filtration from the capillary walls of the circulatory system into the minute connective tissue interspaces and into meshes between tissue cells. On account of its extremely thin character and slow movement lymph assists or supplements the blood within the capillaries in supplying the tissues with fluid and nutriment in solution. The lymph spaces form capillaries and tubes called lymphatics, which finally carry the lymph to the blood circulation by emptying it into the large veins on either side of the neck (see page 62). The flow of lymph is maintained chiefly by tissue (muscular) pressure, assisted by valves which are liberally distributed throughout the larger lymph vessels.

LYMPH GLANDS are inserted along the lymph vessels, every lymph vessel passing through one or more lymph glands before it eventually reaches the blood stream. While red blood cells do not escape from the blood capillaries, the white cells, which are ameboid in character, are able to pour themselves through minute intercellular spaces and enter the lymph stream (Fig. 44). As

the lymph moves sluggishly through the tissues (Cannon likens lymph to water in a marsh, while blood is like the clear water in streams running through swampy land[1]) the leucocytes (also called scavengers, phagocytes, and white blood cells) have time to

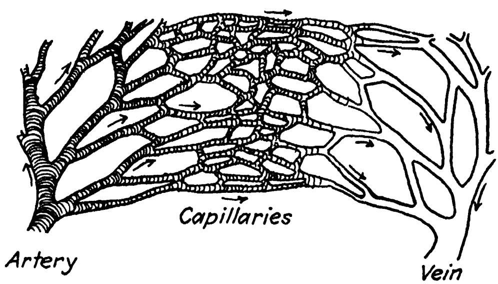


FIG. 43.—The course of the blood stream. (*Gregg and Rowell, Personal Health, World Book Company.*)

pour themselves around bacteria and other foreign substances—such as clotted blood in a bruise (see page 183)—and either digest them or carry them along to the venous circulation.

The lymph glands are spongy filters filled with leucocytes and lymphocytes. As the lymph is forced by backward pressure through the lymph glands (there are more vessels entering than leaving the gland), further removal and destruction of bacteria and other deleterious substances take place. Where there is an acute local infection in the path of the lymph vessels enlargement and even tenderness of the gland may occur, or, in extremely localized infections, the breakdown of lymph glands with suppuration (formation of pus) may take place.

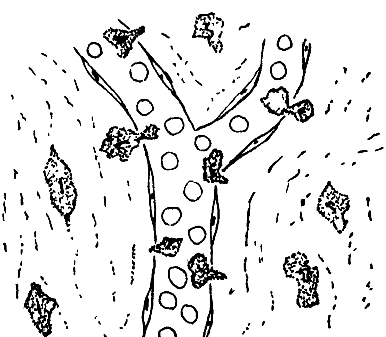


FIG. 44.—White blood corpuscles escaping from blood capillaries.

In tonsillar infections, both acute and chronic, the lymph glands of the neck become enlarged. In tuberculous children the lymph glands of the mediastinum (the area at the roots of the lungs)

[1] *Ibid.*, p. 28.

enlarge, and the glands of the neck may break down and form tubercular abscesses.

THE LYMPH ORGANS of the body, in addition to the lymph vessels and lymph glands just described, include the tonsillar ring (see page 115), which consists of four lymphoid glands—the nasal tonsil or adenoids, the two faucial or throat tonsils, and the lingual or tongue tonsil. The specific function of the tonsilar ring seems to be that of safeguarding the body by removing, through phagocytosis (see page 183), disease germs and other injurious substances from the food and air entering the body. Peyer's patches ("intestinal tonsils") are masses of lymphoidal gland tissue scattered throughout the lining of the lower part of the small intestine (see page 238) and, presumably, having a protective function similar to that of the tonsillar ring in the throat.

THE RETICULO-ENDOTHELIAL SYSTEM[1] is closely associated with the lymph system and consists of a great number of peculiar cells derived in part from the same source as connective (reticular) tissue and in part from endothelial cells. These cells seem to retain embryonic character and are able to adapt themselves to a variety of purposes. Reticulo-endothelial cells are found in the spleen, lymph nodes, bone marrow, liver, and thymus and scattered throughout connective tissue; in the form of monocytes (see page 110), they even circulate in the blood. The reticulo-endothelial cells seem to play specific parts in blood formation and in the production of immunizing antibodies (see page 184).

THE SPLEEN, in addition to its reticulo-endothelial, lymphatic function, seems also to store fresh red blood cells and feed them into the blood stream as needed, especially in emergency (see page 137).

THE BLOOD is a very stable watery solution in which are found approximately 0.9 per cent of salt (sodium chloride) and approximately 0.1 per cent of sugar (glucose); also a very constant amount of colloidal protein, which gives the blood its viscid quality, and a very constant amount of calcium.

The acid-base balance of the blood and tissues is extremely important, and the mechanism for maintaining this at a fixed

[1] MARTIN, HENRY NEWELL, *The Human Body*, p. 330, Henry Holt & Company, 1934.

ratio is so delicate that the acid-base reaction of the blood does not vary in life by so much as 1 per cent[1] (see page 83).

RED BLOOD CELLS.—Within this very stable fluid solution float numbers of red cells, also fairly stable in number and composition, whose function it is to pick up oxygen from the air in the lung cells and transport it, loosely combined, to the various tissue cells of the body. Each cell then takes up its consignment of oxygen, with which it kindles its carbohydrate fuel, thus releasing energy and making "behavior" possible.

The red cells are manufactured within the red bone marrow in the well-protected and economically used spaces within the bones (Fig. 8). The red cells are nucleated when first formed in the bone marrow but soon lose their nuclei and become flattened, disclike in shape, and hollowed in the center. In the blood of the average normal adult float some 23 million million red cells, or about 5 million per cubic millimeter. The red cells live for about three weeks; so a million million new cells must be formed daily within the blood-forming centers in the bones, or several hundred million each minute. When the red cells die (as they are doing constantly) their debris is picked up by the reticulo-endothelial cells, where it is broken up chemically and the material is stored in the liver to be used again.[2]

WHITE CELLS.—In addition to the red blood cells, every cubic millimeter of normal blood will contain about 7,000 white cells (see Lymph). There are three general classes of the white or colorless cells: leucocytes, monocytes, and lymphocytes, and the number of each and the ratio of these to each other are specific.[3] The chief function of the leucocytes (microphages, phagocytes, or cavengers) is to remove harmful substances from blood and ymph. Nature has accomplished this important protective ervice through the simple scheme of making the leucocytes able o use bacteria and other foreign substances for food (see page 183).

[1] SHERMAN, H. C., *Chemistry of Food and Nutrition*, The Macmillan Company, 1932.

[2] "Thus all of us, even vegetarians, are consumers of animal cells—our own cells."

HARVEY, B. C. H., *Simple Lessons in Human Anatomy*, p. 206, American Medical Association Press, 1931.

[3] MARTIN, *op. cit.*, p. 327.

The ameboid leucocytes comprise 60 to 75 per cent of the white cells. The monocytes (macrophages) just mentioned in connection with the reticulo-endothelial system are few in number and large in size, ameboid in character, and protective in function in that they engulf and remove large particles of foreign matter, such as foreign red blood cells and the larger microorganisms. The third class of colorless blood corpuscles consists of the lymphocytes, which are manufactured in the lymph nodes and carried to the blood in the lymph stream. These cells are small and they are not ameboid. They may be involved in stimulating growth and in the production of antibodies, but this is not yet certain.[1]

If an active infection starts in some part of the body (*e. g.*, the appendix) and bacteria multiply rapidly, the leucocytes also multiply rapidly; they may multiply so rapidly, on account of a surfeit of food, that they gorge the infected tissues, die, and enter into the formation of pus. The virulence and progress of an infection can be fairly accurately estimated by making successive "white blood counts."

Blood platelets are minute disc-shaped, short-lived bodies which have ameboid properties. They seem to have some function in clotting (see page 111), and disintegrate quickly on removal from the blood stream.

Blood Volume.—We have spoken of the very uniform composition of the blood at all times in health, and of the fact that the ratio of the substances dissolved in it to the total blood volume can vary in life within only very narrow limits. The blood volume is vitally important, as the heart action and circulation depend upon a certain tension or fullness within the blood vessels. The mechanisms for keeping the blood volume and blood composition stationary are complicated and interesting. Without the regulatory mechanisms loss of blood from hemorrhage or of blood fluid from deprivation of water would quickly be fatal. One of the devices for regulation of blood volume is the lymphatic system (page 106). If more water is taken into the body than is needed by the blood, or than can readily be strained out by the kidneys, it seeps into the "lymphatic swamp" and is stored within the connective tissue interspaces in skin and muscle, where it is quickly drawn back into the blood capillaries when the osmotic

[1] *Ibid.*, p. 329.

balance is disturbed by too high concentration of the blood plasma (see page 108). The kidney mechanism reacts sensitively to blood pressure and blood composition.

BLOOD CLOTTING. —Warm-blooded animals have always fought and bled. Bleeding has been one of the major hazards in animal evolution. We are not surprised (when we consider the critical importance of the blood volume and its circulatory function) to find that nature has evolved a specific device for preventing excessive bleeding—this is blood clotting. The chemistry of blood clotting is not yet fully understood. Nothing just like it occurs elsewhere in animal physiology. It has been mentioned (page 108) that blood plasma contains colloidal protein; it contains in fact two types of protein: globulin and serum albumin. The serum albumin is of much the same nature as egg white. The globulin exhibits several forms, of which one is *fibrinogen;* when stimulated by an enzyme called *thrombin,* fibrinogen produces *fibrin,* the tough, elastic fibers which constitute the basis of the blood clot. *Thrombin,* in turn, is created under the stimulus of the injury. The following factors enter into this situation: the presence of an undetermined *prothrombin,* the presence of *calcium salts,* the presence of *blood platelets,* the presence of *injured tissue.*

The blood platelets just mentioned, which are minute nonnucleated bodies, smaller than the red cells, abound in the blood. Their exact function is unknown, but it is certain that they disintegrate quickly after injury to tissue, and something in the chemistry of their disintegration and in the chemistry of tissue injury precipitates the formation of thrombin and fibrin. Blood drawn carefully through a clean tube from a large blood vessel in an experimental animal, so that it does not come in contact with injured tissue, clots slowly, if at all.[1] It has also been proved that thrombin will not form in the absence of calcium salts. An interesting thing about clotting is that the longer bleeding continues the faster the clot forms and the thicker it is, as if nature redoubled her efforts where the situation is serious.

The adrenal glands also seem to play a role in blood clotting, since the administration of adrenalin hastens the process. This is to be expected in view of the fact that the adrenals are the glands

[1] HOWELL, W. H., *Textbook of Physiology,* p. 469, W. B. Saunders Company, 1931.

of emergency energy and function most actively during anger and fear (see page 137), when the animal is most likely to be injured.[1]

HEMOPHILIA is a condition in which the blood does not clot. True hemophilia is inherited as a sex-linked trait, that is, it occurs only in males and is transmitted by the bleeder through his daughters to his grandsons. In most types of hemophilics or bleeders there is a deficiency in calcium salts in the blood, and the condition is treated by injection of calcium salts, usually calcium lactate.

THE BLOOD VESSELS consist of *arteries* having, in their walls, several layers of highly contractile involuntary ("smooth") muscle tissue, which is under very precise and delicate control from the vasodilator and vasoconstricter nerves of the autonomic nervous system (see page 143). Arteries lead from the larger, more muscular auricle and ventricle of the left side of the heart, and divide by branching until they become *capillaries*, exceedingly delicate microscopic tubes which come in contact with every cell in the body, and give and take up nutriment and waste by osmosis. The capillaries then unite until a branching structure, the *vein* (Fig. 43), the reverse of the artery, is formed. The veins double back along the path of the arteries and return the blood from the capillaries to the right auricle of the heart, whence it passes in to the right ventricle and is sent to the lungs, then back to the left side of the heart (Fig. 42). The walls of the veins are less contractile than the arteries, and the venous blood must be forced back to the heart by the pressure of the arterial blood from behind. Semilunar valves (Fig. 45) are situated at frequent intervals throughout the veins in order to prevent the column of blood from dropping back between heart beats.

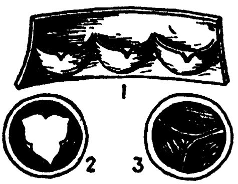


FIG. 45.—Semilunar valves in a vein; 1, vein laid open; 2, valves collapsed, 3, valves closed. (*Stiles, Human Physiology, W. B. Saunders Company.*)

4. *Urine and Perspiration.*—The fluid balance of the body is further regulated by the organs of fluid elimination, the kidneys and sweat glands. The kidneys contain millions of capillaries closely associated with the delicate osmotic mechanisms known as

[1] CANNON, *op. cit.*, p. 44.

glomeruli. If the osmotic balance is disturbed by the presence of too much water in the blood (as from forced drinking) the surplus is strained out with incredible rapidity. Dr. Cannon[1] tells of an experiment in which nearly 6 quarts of water was drunk by each subject in 6 hours. The kidneys eliminated this excess almost as fast as the water was drunk, reaching at the peak of the experiment to the amazing quantity of 1¼ quarts of urine per hour. During the progress of the experiment repeated blood tests showed no appreciable dilution of the blood or elevation of blood pressure.

Under fluid shortage or excessive withdrawal as from hemorrhage, prolonged diarrhea, curtailment of water drinking, etc., the body shows diminished urinary elimination, withdrawal of fluid lymph from the tissue, and diminution in amount of saliva and other digestive fluids. Through these resources the blood volume is maintained at a normal point for an amazing length of time. Cannon tells of dogs deprived of water for several days who showed no change in blood volume or composition.[2] Under severe water withdrawal for any of the reasons mentioned the body tissues shrink and the individual speedily becomes emaciated in appearance. The glomeruli also play an important role in maintaining the acid-base balance of the body (page 83) and in the elimination of mineral and organic waste.

One of the important functions of the fluids of the body is that of heat regulation. The millions of sweat glands automatically bathe the body with an evaporating substance which also contains salt and certain chemical wastes. This withdrawal of fluid under the stimulus of external heat or internal heat from excessive exercise lessens the amount of saliva, creates thirst, and leads to increased intake of cool or cold water, which also serves to reduce body temperature.

Add to these mechanisms for maintaining fluid balance the fact that when unused amino acids are "deaminized" in the liver and when carbohydrate and fat in the form of glucose are burned in the tissues water is released, and we have a picture of a very complete and intricate, almost automatic mechanism for enabling a sea animal to walk about on dry land with a body temperature

[1] *Ibid.*, p. 82.
[2] *Ibid.*, p. 87.

unchanged in hot sunlight or freezing snow, and able to maintain this balance under a great variety of unfavorable experiences, most of the unfavorable experiences, in fact, which have occurred to him throughout his evolutionary history.

Fluids of the Body and Health.—There must be proper fluid chemistry as the result of good nutrition, elimination of waste, and absence of chemical toxins. There must be proper stimulus to movement of fluids through exercise and through exposure of the skin to water and air. There must be freedom from disease specifically affecting the circulatory structures.

Diseases of the heart and blood vessels in middle age appear from morbidity and mortality reports to be increasing in frequency and seriousness, although some authorities think this situation is more apparent than real, since more persons now live to middle and old age. The human heart is a noble organ which is often abused by the youth, only to fail, sometimes quite abruptly, when the individual arrives at what should be his most productive years. Because the heart does not "hurt" it is easy to be unaware that one is wearing it out and inducing obscure and subtle structural changes by subjecting it to the "chemical insult" of narcotics, the toxins of nerve strain or of focal infections, or the mechanical strain of excessive physical work or excessive athletics. The blood vessels share in every experience with the heart. The time to safeguard the heart is in youth—it is too late when the dangerous years have arrived.

References

Cannon, W. B.: *The Wisdom of the Body*, W. W. Norton & Company, Inc. 1932.

Harvey, B. C. H.: *Simple Lessons in Human Anatomy*, American Medical Association Press, 1931.

Howell, W. H.: *Textbook of Physiology*, W. B. Saunders Company, 1931.

Martin, Henry Newell: *The Human Body*, Henry Holt & Company, 1934.

Sherman, H. C.: *Chemistry of Food and Nutrition*, The Macmillan Company, 1932.

Walter, H. E.: *Biology of Vertebrates*, The Macmillan Company, 1929.

CHAPTER XIII

THE RESPIRATORY SYSTEM

The respiratory system is an important branch laboratory, actually, of the digestive system. Its function is to contribute the gaseous element, oxygen, to the cell engines of the body, thereby enabling them to burn the food-fuel and "get up steam" for the body functions and activities. The respiratory apparatus consists of the nose, throat, bronchial passages, and the air cells of the lungs, together with the pulmonary circulation.

The nose projects from the face and directs the air currents to the interior of the body. It has two passageways so that one may still admit air if anything happens to the other. It is lined with ciliated mucous membrane which is covered with a sticky, antiseptic, mucous secretion. By this secretion the inhaled air is moistened, warmed, and sterilized, while the cilia wave toward the exterior and remove foreign material such as dust and germs. The surface of contact of this lining membrane with inspired air is multiplied manyfold by the projection of the shelflike turbinate bones from the septum of the nose (Fig. 46). Back of the nose where the air strikes the posterior wall of the throat is a mass of glandular lymphoid tissue called the nasal tonsil or the adenoid (see page 225); which has a protective function in catching, absorbing, and destroying germs which escape the mucous secretion of the nasal lining (see page 182).

There are many openings from or into the nose and the nasopharynx behind it (Fig. 46). There are two lachrymal ducts which convey tears and secretions from the eyes to the nose; two openings into the maxillary sinuses in the cheek bones; two openings into the Eustachian tubes which lead one to each middle ear; two openings which lead into the frontal sinuses in the brows over the eyes; several openings into the ethmoid cells, where the real nerves of smell are located; the large opening into the pharynx or throat proper. The functions of the nose are to carry air to the

cavities indicated and, as it goes on its way to the lungs as already mentioned, to moisten, warm, and sterilize the air.

The throat admits air to the larynx and trachea and further moistens, warms, and sterilizes the air by passing it over the faucial or throat tonsils and the lingual or tongue tonsil (Fig. 33). *The larynx* contains the organs of vocalization over which air must pass to produce most of the speech sounds. (There are a few speech sounds which do not involve vibration of the vocal cords.)

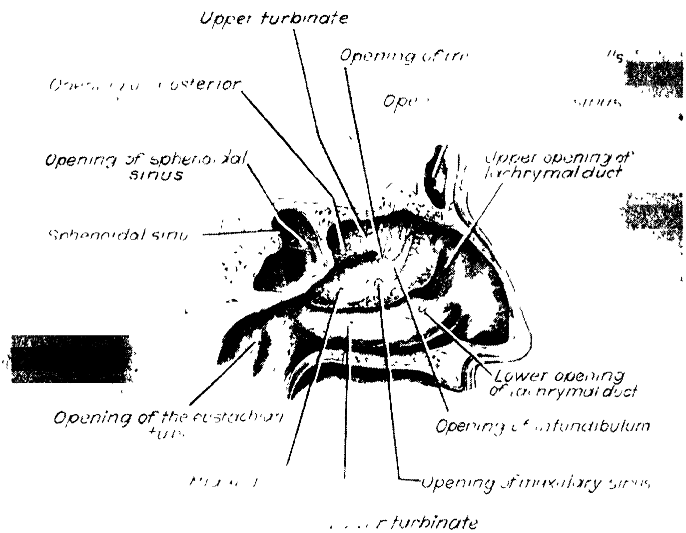


Fig. 46.—The left wall of the human nose showing the various openings

The *trachea*, the passageway which conveys air to the lungs, is cleverly stiffened by plates of cartilage in its walls so that it cannot easily be compressed.

The lungs are composed of the bronchi and air cells. *The bronchi* are the smaller passages into which the trachea divides like the trunk and branches of a tree. *The air cells* are clustered at the ends of the smallest bronchioles like the leaves upon tree twigs. The walls of the air cells are full of delicate capillaries which take up oxygen from the inhaled air and also allow gaseous and fluid waste to filter from the blood in the capillaries into the air within the cells. The air cells provide an enormous surface

for bringing air and blood into osmotic contact; this surface, if spread out, would be 60 times the total surface of the body[1] (Fig. 47).

The throat, trachea, and bronchi are all lined with mucous membrane bearing cilia which wave always toward the mouth, removing foreign matter. This membrane, like that of the nose, is moist with sticky antiseptic mucous secretion. In addition to the reflex contraction and expansion of the bronchial walls in breathing, violent, spasmodic contractions designed to remove injurious substances occur in coughing.

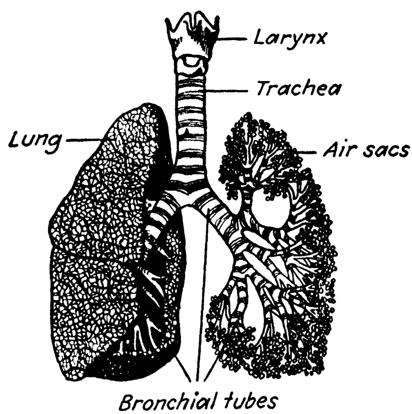


FIG. 47.—Diagram of the structure of the lungs. (*Ritchie, Primer of Physiology, World Book Company.*)

The uses of air in and around the body are: (1). To equalize pressure in all interior cavities, especially in the inclosed cavities of the head, such as the ear, the antrum, and the frontal sinus. (2). To bring oxygen to the circulation of the body. (3) To remove gaseous waste from the body through exhalation and surface radiation. (4) To assist in equalizing the temperature of the body through evaporation and contact.

Dust is composed of impalpable particles constantly released from the surface of the earth and of substances resting upon the surface, which are carried along by air currents and wind. Dust may contain: (1) soil, which may be injurious because its component minerals cause irritation; (2) irritative particles, especially

[1] CRANDALL, LATHAN A., JR., *An Introduction to Human Physiology*, W. B. Saunders Company, 1934.

dust from industrial activities, such as stonecutting, cement-making, coal mining; (3) dried organic matter, such as dried vegetation, dried animal matter, dried fecal matter from highways and streets, dried sputum from spitting; (4) germs associated with any of the above.

The dangers of dust are: first, mechanical irritation to eyes, to mucous membranes and tonsils, and to lung cells; second, infection—disease germs are conveyed by dust to the adenoids and tonsils. Germs of respiratory diseases, such as pneumonia, tuberculosis, and sore throat, may be carried by dust to the throat and lungs. Germs of intestinal diseases and tuberculosis may be lodged by dust in exposed food.

Ventilating the Home.—The requirements of good air are motion, moisture, coolness, and freedom from dust. These qualities are obtained under most conditions by the freest possible admission of outside air.

1. This must be accomplished as evenly as possible. It is much better to have all the windows of the house open a very little from the top in severe weather, even if only a quarter of an inch, than to have one or two large currents of cold air creating drafts and violent motion in some places and leaving the air hot and stagnant in other places. The admission of the cold air from the top of the window tends to a more even mixture of air than admission from the lower part.

2. The floors should be warm and tight and the upper air cool and freely moving.

3. Dustless methods of cleaning should be used.

4. Provision should be made for efficient humidifying apparatus or plenty of evaporating pans on stoves and radiators.

5. The winter indoor temperature should be kept down to 65 to 70°. It has been definitely proved that bodily vigor and immunity to infections are promoted by cool interiors in winter.

If a conditioned-air system is used in school or home, the air should be tested for the factors mentioned, since defects in the system or in the installation sometimes create a condition less favorable than direct outdoor ventilation.

Sleeping rooms should be freely open to outside air in all seasons. This is best accomplished by opening the windows. Where it is impossible to place the furniture so the bed will be

out of a direct draft, or where undue fear of drafts exists, window boards or gauze window screens may be used. Cloth screens should be open-meshed, however, or they may admit very little fresh air.

The hygiene of respiration consists, first of all, as with other bodily functions, in good nutrition. The respiratory structures are to be sustained through balanced diet with particular attention to vitamin A (see pages 86–87). Secondly, as has just been said, it consists in securing optimal conditions as to the air one breathes. Thirdly, posture and exercise are important in securing and maintaining respiratory health (see pages 36–37).

Children should play freely out of doors in all seasons and, properly dressed, in almost all weathers. Infants should take their naps out of doors except in extreme temperatures. A living porch should be much used for eating and recreation. It should be the rule for the entire family to spend every available moment in the open. A fresh-air family is likely to be a happy, wholesome, healthy family.

Students, who must often work and sleep in the same room, need to give careful attention to the temperature and ventilation of the room. It is much the best plan to dress the body warmly, especially the feet, and have cool, moving air about one while working. Moreover, students should not sit in warm classrooms wearing heavy coats. Coats, particularly fur coats, should be removed on entering the room.

References

BAKER, S. J.: "Classroom Ventilation and Respiratory Diseases among School Children," *American Journal of Public Health*, January, 1918.

CRANDALL, LATHAN A., JR.: *An Introduction to Human Physiology*, W. B. Saunders Company, 1934.

HOWELL, W. H.: *Textbook on Physiology*, Chap. XXXVI, "The Chemical and Physical Changes in the Air and the Blood Caused by Respiration," W. B. Saunders Company, 1931.

KOBER and HANSON: *Diseases of Occupation and Vocational Hygiene*, P. Blakiston's Son & Company, 1916.

Report of the New York State Commission on Ventilation, 1923.

ROSENAU, MILTON J.: *Preventive Medicine and Hygiene*, Chap. VI, "Ventilation and Heating," D. Appleton-Century Company, Inc., 1931.

WILLIAMS, JESSIE FEIRING: *Personal Hygiene Applied*, Chap. VIII, "Hygiene of the Respiratory System," W. B. Saunders & Company, 1928.

WINSLOW, C. E. A.: "The Effect of Atmospheric Conditions upon Fatigue and Efficiency," *American Journal of Public Health*, October, 1917.

New Terms in Chap. XIV

Addisin. A hormonelike substance produced in the stomach which helps in regulating blood formation.

Adrenal cortex. The outer structure of the adrenal gland.

Adrenal medulla. The central part of the adrenal gland.

Adrenalin, adrenin, epinephrine. Synonymous terms for the hormone of the adrenal medulla.

Autacoid. A synonym for endocrine secretion including both hormones and chalones.

Autonomic nervous system. See p. 141.

Catalyst. See p. 80.

Chalone. An autacoid which slows or retards the action of an organ or tissue.

Corpus luteum. An endocrine gland which develops within the cavity of the ovarian (Graafian) follicle after the ovum has been expelled, and which atrophies with the onset of menstruation or at the last of pregnancy.

Cretinism. Arrested mental and physical development due to decrease or absence of function in the thyroid gland during growth.

Diuretic. Increasing the production of urine.

Endocrines. The glands of internal secretion; the ductless glands.

Enzyme. See p. 24.

Estrous cycle. The period covered by the development of the ovum and follicle and the development and regression of the corpus luteum; synonymous in the human with menstrual cycle.

Estrus. Periodical sex excitement in the female.

Folliculin, theelin, estrin, female sex hormone, amniotin. The hormone secreted by the endocrine cells lining the Graafian follicle.

Galactogogue. A substance increasing the flow of milk.

Gastrin. A hormone supposed to regulate the production of the digestive secretions of the stomach.

Goiter. An enlargement of the thyroid gland.

Gonadotropic hormone. The anterior pituitary hormone regulating the activity of the gonads or reproductive glands.

Gonads. The ovaries and testicles, the organs producing eggs and sperm cells.

Hormone. An endocrine secretion which stimulates activity in another organ or tissue.

Hypersecretion. Overactivity of secretory cells.

Hyposecretion. Decreased activity of secretory cells.

Hypophysis. The pituitary gland.

Hypothalamus. See p. 141.

Insulin. A hormone produced by the Islands of Langerhans which regulates the metabolism of sugar in the tissues.

Islands of Langerhans. Minute endocrine glands scattered throughout the pancreas, producing the autacoid insulin.

Myxedema. A condition produced in adult years by a certain type of thyroid deficiency.

Obesity. Excess of body fat.

Oxytocic. Stimulating uterus contraction.

Pancreaticotropic hormone. The anterior pituitary hormone regulating the activity of the Islands of Langerhans in the pancreas.

Parathormone. The hormone of the parathyroid glands.

Parathyroid. A group of small endocrine glands embedded in the supporting tissue of the thyroid.

Parathyreotropic hormone. The anterior pituitary hormone regulating the activity of the parathyroid gland.

Pineal gland. An endocrine gland situated near the base of the brain.

Pitocin. A hormone of the posterior pituitary derived from pituitrin and stimulating contractions of the uterus

Pituitary gland. One of the endocrine glands situated at the base of the brain.

Pituitrin. The autacoid produced by the posterior pituitary from which pitocin has now been separated.

Postpartum. Following childbirth.

Prepituitary. The anterior lobe of the pituitary gland.

Progestin, progesterone, lutein. An autacoid secreted by the corpus luteum, which has both hormone and chalone properties.

Prolan A, prolan B. Supposed hormones of the anterior pituitary which regulate development of the Graafian follicle and the corpus luteum, respectively. These have not been isolated.

Prosecretin. An intermediate substance found in the duodenum which becomes converted into the hormone secretin when gastric acid is added.

Puberty. The age at which the reproductive organs become functional.

Secretin. A hormone which regulates the activity of the pancreatic gland cells.

Sex hormones. A class of specific autacoids which, in various ways, regulate the development and functioning of the sex cells.

Suprarenalatropic hormone. The anterior pituitary hormone regulating the activity of the suprarenal gland.

Thalamus. See p. 141.

Thyreotropic hormone. The anterior pituitary hormone regulating the activity of the thyroid gland.

Thymus. An endocrine gland lying under the sternum.

Thyroid gland. An endocrine gland situated in front of the neck.

Thyroxin. The hormone produced by the thyroid gland.

Torso. The trunk of the body.

CHAPTER XIV

THE ENDOCRINE SYSTEM

We are impressed by this time with the fact that the human body is composed of a number of mechanisms or systems, each highly specialized in function, but all closely integrated with each other and dependent upon each other. We have considered the structural and locomotive mechanism, the general chemical or digestive mechanism, and the circulatory or fluid mechanism. To these we must add a more recently discovered chemical system which is intimately associated with nutrition and body chemistry, and also with the next system to be described—the nervous or "communicating" system—and with reproduction. The endocrine glands differ from the salivary, gastric, and pancreatic glands in that their secretions are extremely minute in quantity but extremely concentrated and potent. So small are endocrine secretions in amount that they are usually simply filtered by osmosis directly from the secretory cells of the gland into the capillaries passing through the gland structure. Another term for endocrine glands is *ductless glands;* still another is *glands of internal secretion.* The secretions of the endocrine glands have the curious property of stimulating or retarding the activity of organs and structures remote from the gland and connected with it in no way whatever except through the presence of the secretion in the common carrier, the blood stream. Since the endocrine secretions are catalytic (see page 86) in character they are sometimes called *chemical messengers.* Harvey likens them to the letters conveyed by a common carrier, the mail train, but each arriving at a particular destination according to its address! A specific name for the endocrine excitors is *hormone* (from Greek *hormaein,* to excite or arouse to action). The specific name for the endocrine depressors is *chalone* (from Greek *chalaein,* to relax), while the general term *autacoid* is applied to both.

The discovery of internal secretions has revolutionized understanding of physiological chemistry and animal behavior; it has

opened an entire new field of medical therapy, and has made important contributions to the understanding of personality and conduct. At the same time the subject is a new one, and a great deal remains yet to be discovered. It is possible to sketch here only the general outlines of the system and give a few of the important specific effects of the endocrine glands. The student is urged to read further on this fascinating subject from the references listed, or from any other recent, authoritative treatise.

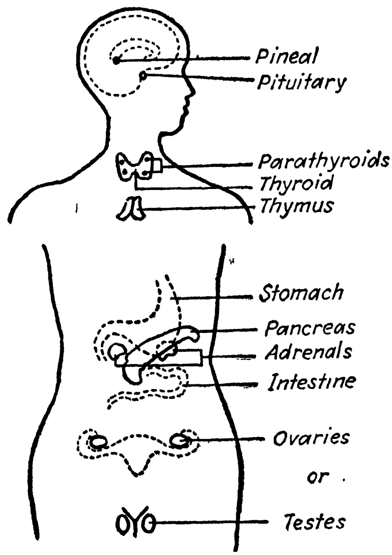


FIG. 48.—The location of the endocrine glands. (*Hoskins, Tides of Life, W. W. Norton & Company, Inc.*)

The Pituitary (Hypophysis).—The endocrine glands are distributed impartially among the organs of the body. We shall discuss them as we come to them in surveying the body structure from the head downward. Two tiny glands (the pituitary and the pineal) are carefully and safely hidden in the interior of the skull at the base of the brain (Fig. 60). One of these, the pituitary, not much larger than a pea, consists of two parts, the anterior and the posterior, secreting entirely different substances with a *pars intermedia* between them which may prove to have secretory functions.

The anterior pituitary (*prepituitary*) occupies a unique place within the endocrine system and has been called "the general headquarters" of the system. The anterior pituitary lies adjacent to the hypothalamus in the brain and is so connected with it through a part of the pituitary blood vessels that some of the anterior pituitary secretion passes into the thalamus, while the rest of the secretion passes into the pituitary capillaries and thus into the general circulation.

The thalamus (of which the hypothalamus is a part) is a sort of clearinghouse structure near the center of the brain, active as a go-between for the thinking cortex and the autonomic nervous system which regulates the physiological actions of the body (see page 142). It is sometimes called the seat of the emotions and seems to act as a sort of bridge between consciousness and the body.

Herrick says,

> There are also higher regulatory centers in the very middle of the brain (thalamus) where the separate visceral processes are reported and kept in proper coördination and balance, so that chewing and tasting and swallowing and breathing and bawling out the cook for burning the toast will not work at cross-purposes. The general regulation of body temperature is attended to here, and also the local activities of the ductless glands or endocrines are played off, one against the other, with mutual reinforcement or reciprocal restraint.[1]

This brief description gives us an idea of the strategic location of the pituitary gland.[2]

[1] HERRICK, C. J., *The Thinking Machine*, p. 117, University of Chicago Press, 1929.

[2] P. T. Herring, speaking of "The Pituitary, the Master Gland of the Body," in an address before the British Association for the Advancement of Science, Sept. 14, 1935, said, "For its size the pituitary is the most important organ in the body. In addition to its well known functions of regulating growth and controlling the sex organs, it acts on all the other ductless glands, it is stimulator to the thyroid, parathyroid, adrenal cortex and the endocrine tissue of the reproductive organs, and an inhibitor of the control of sugar utilization by the pancreas. Further it acts and reacts with the neighboring portion of the brain (the hypothalamus), so that together they form an integrated whole. It has a peculiar blood supply which insures that part of its secretion is carried directly to the hypothalamus while the rest is thrown into the general circulation. Evidence is accumulating that the

The anterior pituitary manufactures a number of endocrine secretions which may for the present be classified as: (1) a hormone regulating general growth, in the absence of which all growth becomes arrested; (2) a specific skeletal-growth hormone; (3) a thyreotropic hormone necessary to the functioning of the

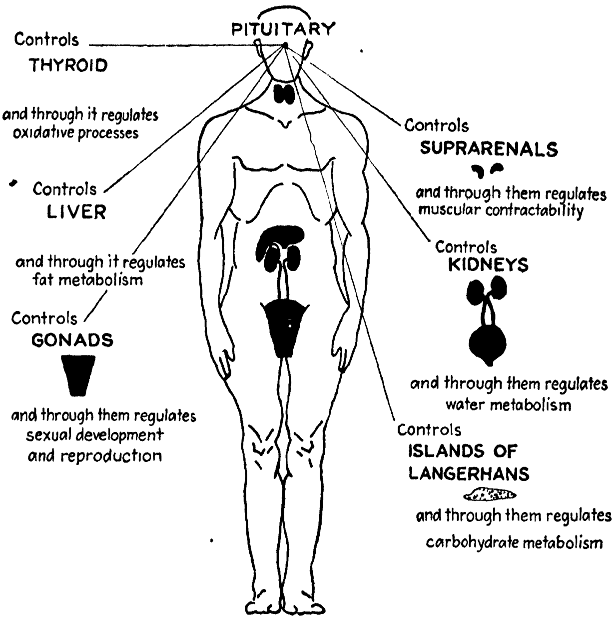


FIG. 49.—Pituitary control of the body. (*Gregory, A. B. C. of the Endocrines, Williams & Wilkins Company.*)

thyroid; (4) a parathyreotropic hormone essential to the parathyroids; (5) a suprarenalatropic hormone regulating the suprarenal cortex; (6) a pancreaticotropic hormone which balances the action of insulin in the metabolism of sugar; (7) a galactogogue hormone (prolactin or galactin) which regulates the flow of milk

---

hypothalamus is an important, if not the main, site of integration of the basic vital activities of all vertebrates. The metabolism of solids, and of water with its accompaniment of hunger and thirst, the regulation of body temperature, emotional reactions, sleep, mating and reproduction may have an anatomic basis in the hypothalamus. On the one hand, pituitary secretion is under the control of nerve fibers emanating from the hypothalamus and on the other the pituitary hormones stimulate the hypothalamus to set in train nervous activities in remote parts of the body."

during lactation; (8) two or more distinct gonadotropic hormones (commonly called prolan A and prolan B) which stimulate and regulate the reproductive functions of the ovary.

Deficiency in the general growth hormone will cause arrest of all growth. Deficiency in the bone-regulating hormone produces a certain type of dwarf. Deficiencies in the gland-regulating hormones play roles in many forms of physiological disorders, both directly, owing to removal of regulatory stimulus from a particular gland, and indirectly, owing to disturbance of the work of other glands and of the thalamus, since all the body functions are thrown out of alignment or balance. Hypersecretion of the skeletal hormone in childhood speeds up the growth of the long bones, producing the seven- and eight-foot giants seen in side shows. Oversecretion of this hormone after growth has stopped causes enlargement of certain flat bones, producing distortion of the skull with enlargement of the face and change in features, voice, and personality, a condition known as *acromegaly*.

The anterior pituitary hormones which regulate the other major endocrine glands have not been isolated or named and are being studied experimentally. Enough is known to indicate the appropriateness of the title "general headquarters" of the glandular system.

The anterior pituitary through the hormone *prolactin* (galactin) shares with the corpus luteum the preparation of the mammary glands for lactation, and regulates the flow of milk during lactation.

The gonadotropic hormones are discussed in connection with the gonads on page 138.

The posterior pituitary produces the well-known secretion *pituitrin* or *hypophosin*. The chemical formula is known and pituitrin is now manufactured synthetically and is widely used in medicine to control hemorrhage, raise blood pressure, hasten slow uterine contractions, etc. Several specific actions are now recognized, although, with the exception of *pitocin*, it has been impossible to separate and identify the specific factors producing these varied effects. It seems probable that the following subhormones may be separated from pituitrin: (1) a hormone regulating fat metabolism in the liver; (2) a hormone regulating the dilation of the pupil of the eye; (3) a hormone regulating tone and con-

tractility of blood vessels, thus raising blood pressure; (4) a hormone and a chalone (diuretic and antidiuretic) stimulating and checking the activity of the kidneys; (5) a set of hormones and chalones affecting intestinal peristalsis and gastric secretion; (6) a specific hormone, *pitocin*, which stimulates contraction of the uterus (oxytocic effect), thus playing an important role in childbirth. Pituitrin or pitocin is sometimes given to hasten expulsion of the child in certain types of prolonged labor. Hoskins says that when the concentration of pituitrin in the blood reaches a certain point contractions of the uterus occur causing pain, which, in turn, stimulates the adrenals to pour out an

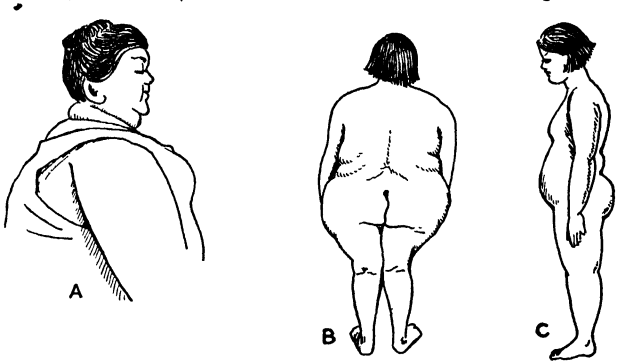


FIG. 50.—Types of obesity. *A*, thyroid, huge rolls of fat; *B*, pituitary, slender ankles and wrists, large accumulation of fat about torso; *C*, general obesity, amenable to diet.

increased amount of adrenin, and both hormones together produce continued postpartum (following birth) contractions which prevent hemorrhage and promote the return of the uterus to normal size.[1]

Deficiency in the fat-regulating hormone of the posterior pituitary leads to incomplete oxidation of fat in the tissue. A large amount of soft fat accumulates about the torso, producing characteristic glandular obesity (Fig. 50). Imbalance in the diuretic and antidiuretic autocoids leads to disturbance in salt metabolism, and in water retention and utilization. Altogether, nature was wise in providing extraordinary protection of these scraps of magic tissue, the pituitaries!

[1] HOSKINS, R. G., *The Tides of Life*, p. 140, W. W. Norton & Company, Inc., 1933.

The pineal gland (conarium pinealis, "pine-cone-shaped") hangs suspended by a tiny stalk from the underside of the brain posterior to the pituitary (Fig. 60). In the adult it is about a third of an inch long and weighs about 2 grains. In young children it is larger. It decreases in size from about seven years on, and later becomes filled with calcium salts ("brain sand"). Recent experiments with pineal extract seem to prove that autacoids are present which may retard growth and speed up development and differentiation of specific structures. The administration of pineal extract to successive generations of experimental animals causes arrest of growth in size in the progeny, together with precocious maturation of organs and tissues—producing a very small adult at an abnormally young age.[1] Excess of pineal secretion may be one factor in the cases of which one reads of children growing beards and conversing in Latin at four or five years of age. Pineal hormones have not yet been isolated or named.

The thyroid gland sits astride the trachea in front of the neck. It was the first endocrine gland studied and is probably the most fully understood. It appears early in fetal development, and functions before the birth of the child. Chemically, the thyroid controls iodine metabolism, converting food iodine into the hormone *thyroxin* and storing it in colloidal form in tiny vesicles within the gland. The thyroid has a very rich blood supply, making it possible for the blood stream to receive thyroxin rapidly on demand. The function of thyroxin seems to be that of assisting in the regulation of oxygen activity in the body (see page 67); that is, in the oxidation of food fuels and the production of energy. How this regulation of oxidation is accomplished is unknown and may rest in part upon the close interaction between the thyroid and adrenals. Basal metabolism is very directly affected by the thyroid (see page 69). *Hypothyroidism* (too little action) shows in lessened energy production and lowered basal metabolism—the individual is cold-blooded and listless; his body is not oxidizing fuel properly. The thyroid may then enlarge enormously in a vain attempt to do its work, producing a condition known as *simple goiter*. The usual cause is lack of

[1] Hansen, Rowantree, Clark and Steinberg, "The Biological Effect of Pineal Extract," *Science*, Feb. 14, 1936.

iodine in food and water. Simple goiter abounds in certain regions in which the iodine left by the receding sea has been drained out of soil and water. Schoolchildren in such regions are often routinely given some preparation of iodine. Since the thyroid actively affects reproduction, a moderate enlargement may occur during puberty and menstruation and during pregnancy. This may be physiological rather than pathological and tends to disappear with the establishment of a regular menstrual cycle or with the birth of the child.

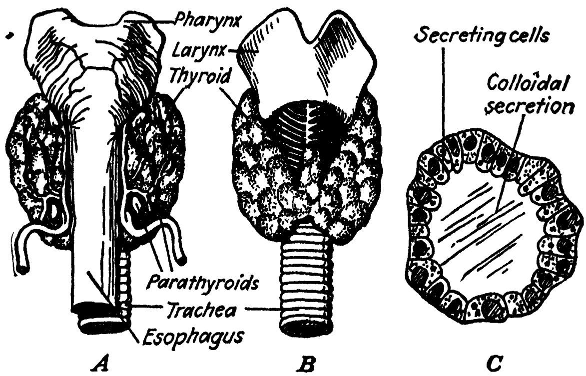


FIG. 51.—The thyroid and parathyroid glands. *A*, seen from behind, showing the four parathyroids and the blood vessels supplying the glands; *B*, the thyroid from the front; *C*, a thyroid follicle greatly enlarged.

Hyperthyroidism (too great activity) shows in excessive nervousness; the person so affected has a rapid pulse, cannot tolerate heat, is overenergized, and has increased basal metabolism. One form of hypersecretion known as exophthalmic goiter, toxic goiter, or Grave's Disease, may be associated with continued stress or worry and may produce spectacular personality changes. It is an obscure disease probably involving other glands and the autonomic nervous system and is not completely understood at the present time.

If the thyroid fails to function in fetal life or in early childhood, the child is mentally defective and fails to develop sexually or mentally. This condition is called *cretinism* or *childhood myxedema*. The face of such a child is heavy-lidded, puffy, and stupid. His hands and feet are broad and clumsy. The child is

listless, dull, and lacking in strength and energy. The administration of thyroxin often produces miraculous changes in such children, particularly in cases developing after birth if treated while the victim is very young.

A certain type of thyroid deficiency in adult life may cause *myxedema*. Since all the other endocrine glands and the vital organs in general suffer under lack of a normal amount of thyroxin, the symptoms of myxedema are doubtless due in part to the lessened function of other glands and organs. Obesity (Fig. 50), mental changes, loss of energy, and many other symptoms characterize this condition. "Shifts in the thyroxin level are accompanied by changes in the functions of the liver, the pancreas, the pituitary, and the adrenal glands."[1] It has been said that three and one-half grains of thyroxin [the total content of the body at a given time] is all that lies between genius and imbecility.

Thyroxin is now manufactured synthetically (artificially), making it no longer necessary to use glandular extracts in medical treatment. While much remains to be discovered as to just how the iodine in the form of thyroxin affects the chemistry of the body tissues, it is apparent that this remarkable gland is concerned in the regulation of carbohydrate oxidation; assists in the regulation of protein and fat metabolism; helps the kidneys and skin to free the body of waste products; stimulates general growth, and specifically the growth of the brain and sex organs.

Truly the wonder grows as we learn of the incredible potencies of minute amounts of particular chemical substances.

The parathyroids are four (sometimes more) small glands about the size of grains of wheat which are found embedded upon the posterior surface of the thyroid (Fig. 51). They are so small and inconspicuous that they escaped detection long after the thyroid was fairly well known. The serious effects following the first complete removal of the thyroid gland were in considerable part due to the coincident removal of the parathyroids. A hormone called *parathormone* has been isolated from the parathyroid glands.

One of the chief functions of parathormone is the regulation of calcium-phosphorus-magnesium metabolism, in which its effect

[1] HOSKINS, *op. cit.*, p. 97.

is associated with vitamin D.[1] Under deficiency in young animals the teeth develop imperfectly, the bones are small and brittle. Under prolonged deficiency there is lessening of blood calcium and disturbance of the calcium-phosphorus-magnesium balance (see page 77). In case of overadministration or oversecretion of parathormone both calcium and phosphorus are withdrawn from the bones and replaced with fibrous tissue, a condition known as *osteitis fibrosa cystica.* The blood calcium may be raised to a point such that actual clotting of the blood in the vessels occurs, and the blood literally becomes too thick to circulate.

Since calcium is essential to nerves as well as to blood and bones, parathormone deficiency produces marked nervous symptoms resulting in *tetany* or convulsions somewhat resembling the toxic convulsions of strychnine poisoning, hydrophobia, and lockjaw. This suggests that one function of the parathyroids may be the neutralization of certain toxic chemical wastes in the body. While much remains to be discovered, it seems certain that parathormone acts as a catalyst or enzyme which promotes bone formation and quick mobilization of lime and phosphorus in nerve and muscle activity.

The thymus is the next endocrine gland we encounter in our exploration of the body. The thymus is a large gland found behind the sternum and extending from the neck to the base of the heart in childhood, but shrinking much in size from puberty to adulthood. The gland resembles in structure the pancreas (sweetbread) and is sometimes called the "neck sweetbread."

The thymus consists of a cortex (outer layer) and medulla (center or core). The medulla resembles lymph glands in structure and contains lymphoid cells and reticulo-endothelial cells (see pages 108–184). One theory advanced as to the function of the thymus is that it may manufacture white blood cells; another is that it may manufacture, or at least store, nucleoproteins. While the thymus has been studied for many years, its exact function is not yet clear. It seems certain that it performs valuable offices in relation to nutrition, since its size varies in direct ratio to the rate of growth and it shrinks markedly during starvation or undernourishment. Recent experimental studies,

[1] AUB, JOSEPH C., *Glandular Physiology and Therapy,* Chap. XXV, "Parathyroid Hormone Therapy," American Medical Association Press, 1935.

particularly those of the Philadelphia Institute for Medical Research, seem to show that the thymus stimulates both growth and development.[1]

Infants born with exceptionally large thymus glands may turn blue, struggle for breath, and even die suddenly. They become large, soft, fat children with weak hearts. Children with enlarged thymus glands may die suddenly under anesthesia or while running or exerting themselves in competitive games. The exact reason for this must remain obscure until the function of the gland is better understood. This condition, fortunately, is easily diagnosed with the X-ray, and the gland shrinks to normal size under X-ray treatment.

No endocrine secretion has been definitely isolated from this organ, and some even doubt that the thymus is really a gland of internal secretion. Again we must await the results of future research.

Certain gland cells of the stomach are supposed to secrete, soon after food is swallowed, a hormone called *gastrin*. "This is taken for a joyride through the body. That part of it which finally gets back to the stomach stimulates the secreting cells, and gastric juice [hydrochloric acid and pepsin] is poured out."[2] Very recent reports indicate the existence of an *antianemic*, hormonelike substance in the gastric juice which is essential in blood chemistry. Deficiency is associated with *pernicious anemia*. This antianemic substance is stored in the liver, spleen, and kidney.[3] It is proposed to call this *addisin*[4] (see page 259).

The duodenum (the first section of the small bowel leaving the stomach) contains in its lining a mechanism for producing a *prosecretin* which turns into the hormone *secretin* when the stomach empties its acid contents into the bowel. Secretin, when

[1] ROWANTREE, L. G., *Glandular Physiology and Therapy*, Chap. XXVI, "The Thymus," American Medical Association Press, 1935.

CAMERON, A. T., *Recent Advances in Endocrinology*, p. 267, P. Blakiston's Son & Company, 1936.

[2] HOSKINS, *op. cit.*, p. 299.

[3] BEAUMONT and DODD, *Recent Advances in Medicine*, p. 393, P. Blakiston's Son & Company, 1934.

[4] MORRIS, SCHIFF, and others, "Endocrine from Gastric Juice," *Journal of the American Medical Association*, Jan. 21, 1933.

it reaches the pancreas by way of the blood stream, causes the pancreas to secrete the pancreatic digestive juices.

The pancreas, in addition to producing copious digestive secretions which are poured through ducts into the intestine, serves as matrix for many tiny, almost microscopic clusters of specific endocrine gland cells called the *Islands of Langerhans* (Fig. 52). These minute glands manufacture the hormone *insulin,* which helps to control the oxidation or utilization of sugar in the tissues. Under certain conditions not yet well

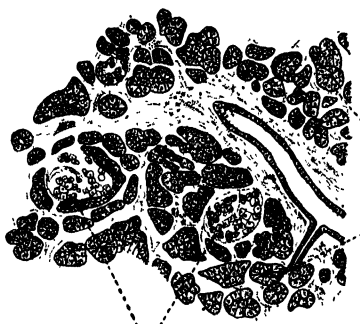


FIG. 52.—A section of pancreas showing two Islands of Langerhans (much magnified). (*Adapted from Crandall, Human Physiology, W. B. Saunders Company.*)

understood the Islands of Langerhans cease to function and cannot, by any means now known, be restored to activity. When this occurs sugar (glycogen) is not normally stored in the liver, and sugar without insulin is not oxidized in the tissues of the body. The blood becomes saturated with unburned (unoxidized) sugar, which is strained into the urine. This condition is called *diabetes* (see page 258). In untreated cases the symptoms of acute starvation and acidosis appear. Literally the tissues starve in the midst of plenty.[1] The body in its great need of sugar fuel converts as much protein as possible into sugar (see page 67), which it is unable fully to utilize. Since it cannot make the sugar burn, the body falls back upon fat-fuels and is able only partially to oxidize these. The imperfectly oxidized fatty acids

[1] HOSKINS, *op. cit.*, p. 318.

may accumulate in the blood stream and cause sudden acidosis, which is the most dreaded complication of diabetes.

The story of the discovery of insulin and of the long patient research that eventually produced a form of the hormone which could be used clinically is one of the many romances of science.[1] The chemical character of insulin is changed in passing through the stomach; hence it must be taken hypodermically. The effort now is to discover some way of making it possible to take insulin by mouth and thus avoid the trying routine of hypodermic injection. Progress is reported from Denmark in the way of an improved insulin preparation, Protamine Insulin, which is more lasting and certain in its activity than is the earlier form of insulin.[2]

Within the 12 years since insulin has been used in the treatment of diabetes it has become the universal prescription, and innumerable lives have been saved and prolonged. Dr. Hoskins, commenting upon the heroic endeavor of the research workers, particularly Banting and Best and the others of the Toronto group who brought the search to success, also says:

> Finally, what thanks shall we render the dogs whose graves serve as silent milestones in the long ascent of the trail? . . . Perhaps, but for their aid, the discovery would still lie in the future, and an aggregate of many thousands of years of human life would already have paid the price of continued ignorance.[3]

The adrenal glands (suprarenals) rest like lumpy dunce caps upon the tops of the two kidneys. The adrenals consist of *cortex* and *medulla*, each a distinct gland, and each having biological origin and physiological function quite different from the other. The adrenals appear relatively large, but weigh only about one-fifth of an ounce each. They have the most liberal blood supply of all organs in the body, having a capacity for receiving seven and one-half times their weight in blood each minute.[4] The cortex, including its blood vessels, has ten times the total mass of the medulla.

[1] *Ibid.*, Chap. XIV.

[2] Editorial, *Journal of the American Dietetic Association*, May, 1936.

[3] Hoskins, *op. cit.*, p. 316.

[4] Harvey, B. C. H., *Simple Lessons in Human Anatomy*, p. 401, American Medical Association Press, 1931.

The cortex presents a curiously striated appearance on cross-section, because the blood vessels supplying the relatively enormous amount of blood send short capillaries through the cortex vertically and very close together (Fig. 53). The cortical cells are filled with fat, chiefly fatlike lecithin and cholesterol (see page 75). It is a curious fact, not yet understood, that the brain cells also are rich in these fats, and that children born without brains also lack adrenal cortices.

The cortex increases in size during pregnancy chiefly because of increase in cholesterol. "Recently evidence has been reported which suggests that the sulphur content of the cortex is of special significance and that the adrenal glands play an important rôle in sulphur metabolism."[1]

In 1927 the hormone *cortin* (also called *interrenalin*) was isolated, and several years later it became available in very small amounts for clinical purposes. The process of extraction and standardization is yet so technical and costly and uncertain that there is still no standardized preparation or reliable source of supply. Apparently there is limited storage of cortin, the gland manufacturing it more or less on demand. This is one reason it is so difficult to collect it in usable amounts. Every effort is now being made to manufacture synthetic or artificial cortin, as has been done with thyroxin, pituitrin, and adrenalin. In 1933 a substance named ascrobic acid (also cevitamic acid) was isolated from the cortex which is apparently identical in chemical composition with vitamin C although not identical in physiological effects. It seems probable that there may be several hormones in the cortex.

The functions of the cortex are, at the present time, best inferred from what happens when the animal is deprived of its service. First of all, if the cortex is entirely removed the animal dies with the symptoms of mental and physical collapse. Individuals with cortical deficiency have poor temperature control, being highly susceptible to both heat and cold. The basal metabolism falls; immunity to infections is lowered and wound repair is delayed; sugar metabolism is profoundly disturbed—indeed this may be the cause of many of the other symptoms. Some think that cortin may be a general cell stimulant. In

[1] HOSKINS, *op. cit.*, p. 30.

children cortical deficiency produces marked arrest in growth. In adults, under serious cortical lack, *Addison's Disease* develops, characterized by the progressive weakness mentioned, with intractable failing of all vital processes. There is further a curious pigmentation or bronzing of the skin. Until cortin was made clinically usable there was no known cure and the disease was invariably fatal. Almost miraculous cures have been reported when it was possible to secure the hormone in time. Unfortunately the victim, apparently, must continue taking cortin, which is, at present, a difficult matter to arrange, as preparations speedily deteriorate and become inert. Recent reports indicate that increase in potassium and decrease in sodium is a basic factor

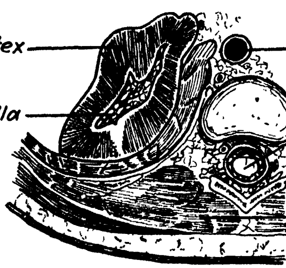


FIG. 53.—Cross-section of the left adrenal gland from a newborn child. (*Adapted from D. J. Cunningham, Textbook of Human Anatomy, William Wood & Company.*)

in cortin deficiency. It appears that regulation of the potassium-sodium balance in the blood and tissues is one of the functions of the adrenal cortex. A low potassium-high salt diet is now a part of the treatment.[1] The administration of cortin to young animals speeds up sex development.

The adrenal medulla arises from the same embryonic source as the autonomic (vegetative, sympathetic) nervous sytem. The medullas are sometimes called "the brain of the sympathetic system" and their function seems to be to reinforce that system (see page 143). The hormone from the medulla, *epinephrin* (also known as *adrenalin* and *adrenin*), has long been isolated and used in medicine and is now produced synthetically. The autonomic nervous system, working below the level of consciousness, adjusts the activity of the vital organs to the demands of the conscious or

[1] THOMPSON and others, University of Chicago, Exhibit of The American Medical Association Meetings, Kansas City, May, 1936.

cerebral brain. This is one of the chief secrets of survival. Indeed, the speed and effectiveness of adjustment to danger are spectacular. The following description from Hoskins will apply equally well to an animal subjected to great fright and to an animal or human being hitherto living quietly and happily, but just given a hypodermic injection of epinephrin:

> The pupils of the eyes dilate [the better to see]; the skin becomes pale and the hair rises [blood diverted to vital organs and a fierce appearance produced]. The activities of the digestive tract promptly cease and their blood supply is mostly transferred to other structures. A similar reaction occurs in the circulation of the other internal organs. Thus many of the sluices are cut off and, the heart beating more forcefully as an additional factor, the pressure in the circulatory system markedly increases. The blood vessels in the muscles are an exception to the general rule; they open wider instead of contracting and thus in a measure let off some of the high pressure. The air ways into the lungs enlarge. Even the composition of the blood is changed by the discharge of an augmented supply of sugar from the liver [fuel for muscle action].[1]

Thus the total physical resources of the animal are almost instantaneously made available for flight or fight. The adrenal medullas are often called "the glands of emergency energy." Under prolonged stimulation from adrenin, either from emotional stimulation or administration of the drug, the coagulability of the blood increases (see page 111) and the spleen contracts, squeezing more red blood cells into the blood vessels and thus providing additional carriers for the oxygen so urgently needed by the muscle cells. Epinephrin is used in medicine to prevent or check hemorrhage, to raise blood pressure in shock, and to relieve the congested mucous membranes and arteriole spasm of hay fever and asthma (page 196).

Adrenin deficiency, as might be inferred, results in lowered function of the vital organs, an inability to adjust to stress or strain. This shows in a disposition to "worry and weep," and in varying degrees of physical and mental ineffectiveness and fatigability, a state commonly known, when extreme, as "nervous exhaustion" or "neurasthenia" (see page 270).

Since adrenin increases work output and relieves the symptoms described it might be inferred that it would be useful in

[1] HOSKINS, *op. cit.*, p. 36.

normal fatigue. It must be remembered, however, that these results are obtained at the expense of slowing down digestion and other body functions, and that nature reserves this radical adjustment for real emergencies.

The adrenals appear very early in prenatal development. In the three-month fetus they are the most prominent organs in the body. Marked decrease in size occurs following birth. There is a close interrelationship between the adrenals and the pituitary (see page 125) and other endocrine glands.

The gonads (reproductive organs, the ovaries and testes) have several endocrine secretions which are important in the perpetuation of life from generation to generation. *In the male* the endocrines regulating the functioning of the gonads are not clearly understood. It is probable that the anterior pituitary in the male, as in the female, plays a role in initiating the physical changes of puberty and in producing sexual maturity. It seems certain that some tissue in the testicle secretes a *male sex hormone*, but it is not clear whether this is the interstitial cells or whether it is certain Sertoli cells resembling somewhat the cholesterol-containing cells of the suprarenal cortex. Some investigators believe the essential male hormone may be produced by the sperm cells themselves.

In the female the endocrines have been extensively studied. The sequence of activity in the female glands is as follows. *The gonadotropic hormone*, (also called *prolan* **A**, the *maturity hormone, the motor of the ovary, and the master sex hormone*), of the anterior pituitary (see page 124) at about the middle of each intermenstrual cycle stimulates the development of one ovum (egg) within a delicate capsule (Graafian follicle) in the interior of one of the ovaries. This ovum develops and the capsule fills with fluid until it ruptures, releasing the egg (*ovum*) from the surface of the ovary (ovulation). The Graafian follicle is lined with secretory cells which produce the hormone *folliculin* (*theelin, female sex hormone, estrin*, or *estrogenic hormone*). This hormone causes the uterus (womb) to prepare for the reception of the ovum by becoming congested. After the follicle ruptures, a *luteinizing* factor (also called *prolon* **B**) from the gonadotropic hormone causes the follicular gland cells to change into the yellow gland which becomes known as the *corpus luteum* or

yellow body. The corpus luteum secretes *progesterone* (*progestin, lutein*) which has a chalone action in preventing further ovulation while an ovum is in the tube.

If fertilization of the ovum occurs the corpus luteum grows in size and prevents further ovulation for the duration of pregnancy. If fertilization does not occur the corpus luteum is short-lived and shrinks to a small scar, and the ovum is expelled, together with the uterine congestion, as *menstrual flow.*

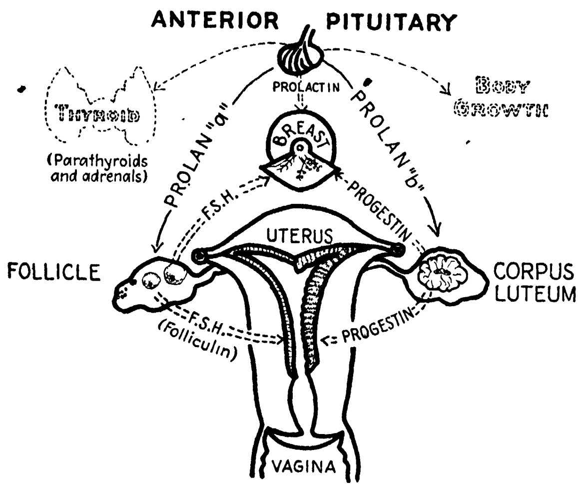


FIG. 54.—Hormonal control of the estrous cycle. (*Dickinson, Human Sex Anatomy, Williams & Wilkins Company.*)

If pregnancy occurs the corpus luteum secretes *progestin* or *progesterone* (similar to theelin and formerly considered identical with it), which promotes the formation of the organ of fetal nutrition, the *placenta.* The corpus luteum also stimulates the preparation of the mammary glands for the manufacture of milk, and through a hormone, *relaxin,* causes a slight softening of the pelvic cartilage at the last stage of pregnancy. The placenta in turn secretes (or stores—at least it contains) progestin, and supports the corpus luteum in restraining ovulation. The placenta also restrains the mammary glands from releasing the milk flow until the placenta is expelled. After the child is born, the mammary glands secrete a luteinizing chalone which normally holds ovulation in check during lactation.

There is an oversecretion of gonad-stimulating hormone during early pregnancy with filtration into blood and urine. Ascheim and Zondek, two German scientists, devised a test for early pregnancy in which a purified and standardized preparation of urine or blood serum from the woman suspected of pregnancy is injected into immature female white mice. If pregnancy exists precocious development of the reproductive organs of the mouse will occur within a few hours.

In general the endocrine glands form a closely integrated, almost automatic living mechanism for adjusting and regulating the massive organs of intellectual and bodily activity. It is necessary to take the role of the endocrines into consideration in trying to understand any phase of physical or mental behavior.

References

AUB, JOSEPH C.: *Glandular Physiology and Therapy*, Chap. XXV, "Parathyroid Hormone Therapy," American Medical Association Press, 1935.

BEAUMONT and DODD: *Recent Advances in Medicine*, P. Blakiston's Son & Company, 1934.

DICKINSON, ROBERT LATOU: *Human Sex Anatomy*, Williams & Wilkins Company, 1935.

Editorial, *Journal of the American Dietetic Association*, May, 1936.

Glandular Physiology and Chemistry, Council on Pharmacy and Chemistry, American Medical Association Press, 1935.

GREGORY, JENNIE: *The A. B. C. of the Endocrines*, Williams & Wilkins Company, 1935.

HANSEN, ROWANTREE, CLARK and STEINBERG: "The Biological Effect of Pineal Extract," *Science*, Feb. 14, 1936.

HARVEY, B. C. H.: *Simple Lessons in Human Anatomy*, American Medical Association Press, 1931.

HOSKINS, R. G.: *The Tides of Life*, W. W. Norton & Company, Inc., 1933.

MORRIS, SCHIFF, and others: "Endocrines from Gastric Juice," *Journal of the American Medical Association*, Jan. 21, 1933.

ROWANTREE, L. G.: *Glandular Physiology and Therapy*, Chap. XXVI, "The Thymus," American Medical Association Press, 1935.

THOMSON and others: University of Chicago, Exhibit of American Medical Association Meetings, Kansas City, May, 1936.

New Terms in Chap. XV

Autonomic. Involuntary, automatic; is applied to that portion of the total nervous system which operates below the level of consciousness.

Cortex. The outer layer or covering of the cerebrum, within which are found the nerve cells active in the thinking process; the organ of consciousness.

Hypothalamus. A division of the thalamus which lies near the pituitary gland.

Parasympathetic. Applies to the cranial and sacral divisions of the autonomic nervous system which inhibit the visceral organs.

Sympathetic nervous system. Sometimes used as a synonym for the entire autonomic, vegetative, "old" or "lower" nervous system, but the term sympathetic is used by most writers to designate the middle division only of this system, the division which stimulates activity in visceral organs.

Thalamus. A mass of gray matter at the base of the brain which communicates with both the cortex and the autonomic nervous system and serves to coordinate body and mind, or inform the mind about the body. It is believed that basic emotions arise in the thalamus and are there reported to and controlled by the cortex—the conscious brain.

The "new" or higher brain. The cerebrum (with the cortex), which is the conscious, thinking part of the brain.

The "old" or lower brain. The coordinating center which arises first in the evolution of the nervous system.

CHAPTER XV

THE NERVOUS SYSTEM

[The cerebral cortex is a] superficial layer of the brain with a thickness varying from one and a half to five millimeters and covering an average of 2,352 square centimeters. This cortex is estimated to weigh about 658 grammes. It is composed chiefly of blood vessels, supporting tissues, and nerve cells. The blood vessels and supporting tissues are merely mechanical accompaniments of an apparatus the real functions of which are carried on by the nerve cells. These cells have been carefully studied, their arrangement and distribution made out, and it is estimated that in a single cortex their number is not far from 9,200,000,000. Notwithstanding this prodigious number, these cells and their processes represent only two per cent of the total weight of the cortex; in other words, the cortical nerve cells and their processes in the average man weigh about thirteen grammes. This amount represents a little less than a cubic inch of material or about one five-thousandth of his total weight.

By means of it we cherish the traditions of the past; its activities include all our conscious states, our simple sensations, desires, hopes and aspirations, our sense of shame and regret at deeds of unworthiness, our joy in generous acts, our knowledge of all these things; from it emanate the impulses to those steps which mark us as honest or dishonest, extravagant or thrifty, secretive and deceptive, or frank, open and free, cold or affectionate, in short all those signs which stand for personality. Socially no part of our bodies is more precious than this cubic inch of cortex. From the cradle to the grave we work to train it. Our early childish plays and lessons are intended to awaken it into activity. The school, the college, the university work upon it; our whole educational system is devised to bring into full efficiency this cubic inch of our body. It must be enriched by experience; it must be trained to make wise decisions, to call forth acts of friendly service.[1]

The "old brain" or lower nerve center with the autonomic nervous system developed first in animal evolution for the purpose of coordinating and regulating the chemical activities of the differentiating cells and tissues as evolutionary organization of life proceeded. It is a device for making a unity of the organism. The autonomic system consists chiefly of ganglia or groups of cells

[1] Parker, G. H., *Biology and Social Problems*, p. 37, Houghton Mifflin Company, 1914.

distributed among the vital organs and coordinating with each other and, later in evolution, with the cortex. The "old brain" is the name given to certain structures at the base of the brain, notably the thalamus. The autonomic nervous system comprises ganglia which stimulate activity (the sympathetic division) and ganglia which inhibit activity (the parasympathetic divisions). The term "vegetative" is sometimes applied to the autonomic system, since it regulates the involuntary or physiological functions of the body.

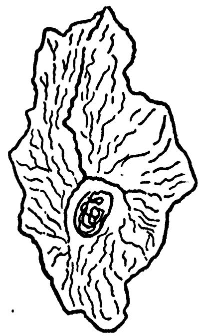


FIG. 55.—Diagram of an ameba showing radial reaction paths converging on the nucleus. (*Modified from Douglas, A. C., The Physical Mechanisms of the Human Mind*, *E. S. Livingston Company*.)

The medulla of the adrenal glands is composed of tissue similar to that of the autonomic (sympathetic) ganglia (see page 136), and in several other places in the body there are masses of autonomic ganglion cells which may act as transformers or relay stations in the autonomic system.

Even in an ameba there are channels of sensitive protoplasm converging upon the nucleus (Fig. 55). With ascent in the animal scale these channels become definitely structuralized and converge within the progressive or forward end of the organism, in which end both the "old" and the "new" brain structures will eventually appear. (In a sense both of the nervous systems and the brain may be said to be "structuralized experience."[1]) Reflex mechanisms develop, consisting of nerve cells and nerve fibers. The *cerebellum* eventually becomes the coordinating center for complicated reflex activities, particularly acquired reflexes, such as musical and athletic performance. The function of all these mechanisms is the coordination of physiological and mental behavior made necessary by the continued evolutionary increase in size and intricacy of structure. The

[1] Structure is organized function, or, as Bergson would perhaps put it, structure is the organization of the past, or organization is the structuralization of function or of the past. From this point of view the nervous system, as a structuralized dynamic gradient or as an organized system of relations between the parts of the organism, is given new meaning. White, W. A., *The Meaning of Disease*, p. 74, Williams & Wilkins Company, 1926.

direction and control of behavior through the autonomic nervous mechanisms may be said to be instinctive. No thought, reason, or conscious direction is involved. As the animal organism

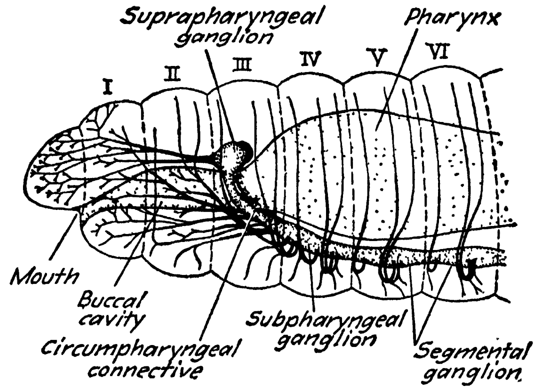


FIG. 56.—Brain and nervous system of earthworm with three body segments. (*From Hess, in Journal of Morphology, vol.* 40.)

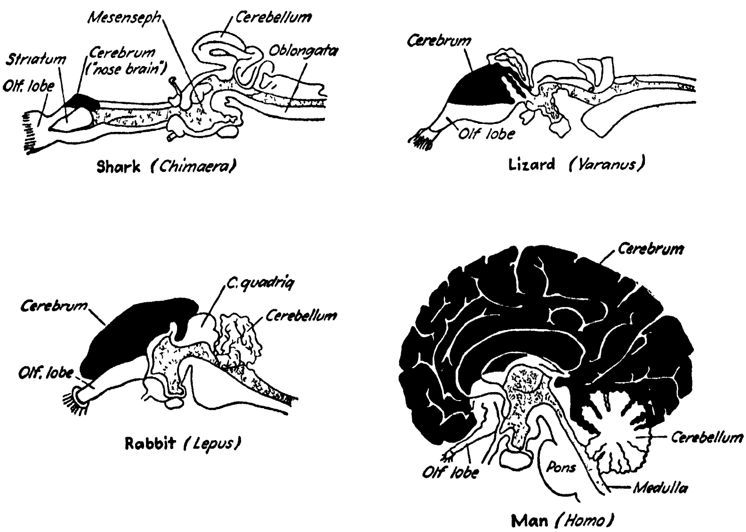


FIG. 57.—The evolution of the cerebrum (new brain). (*Adapted from Koffka after Edinger.*)

develops complexity of structure and of behavior, special organs of sensation appear: the eye, the nose, taste buds, and other specialized nerve endings. The development of the special senses

creates need for a central agency or clearinghouse for coordination and direction of, and for selection from among, the increasing

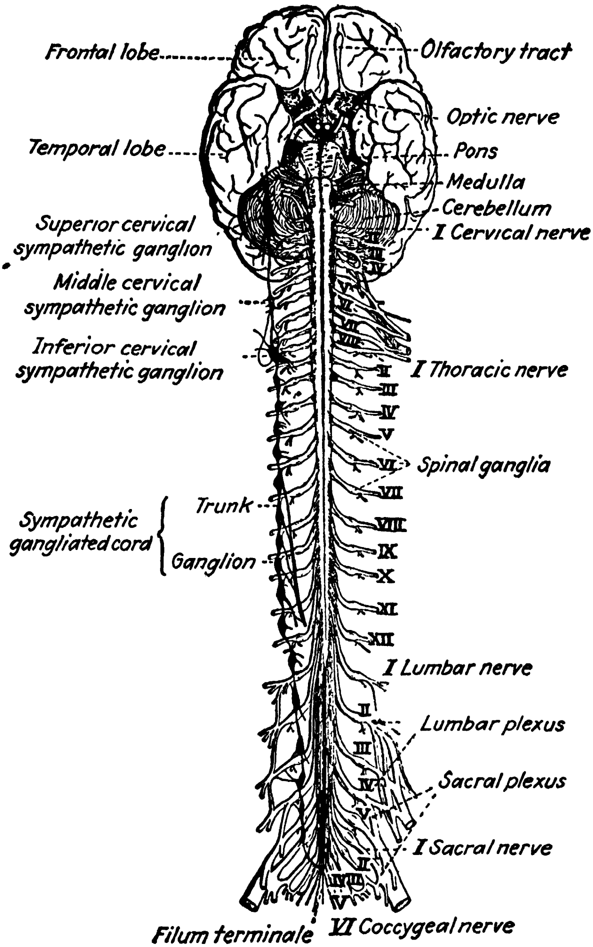


FIG. 58.—The human central nervous system, from the front, showing its connection with the cerebrospinal nerves and with the sympathetic nervous system (drawn in black on the left). (*From Herrick after Allen, Thompson, and Rauber, Introduction to Neurology, W. B. Saunders Company.*)

experiences of the animal. This is the associative thinking or reasoning organ, known as the *cerebrum*. The functioning part

of the cerebrum, as described at the beginning of the chapter, is the *cortex.*

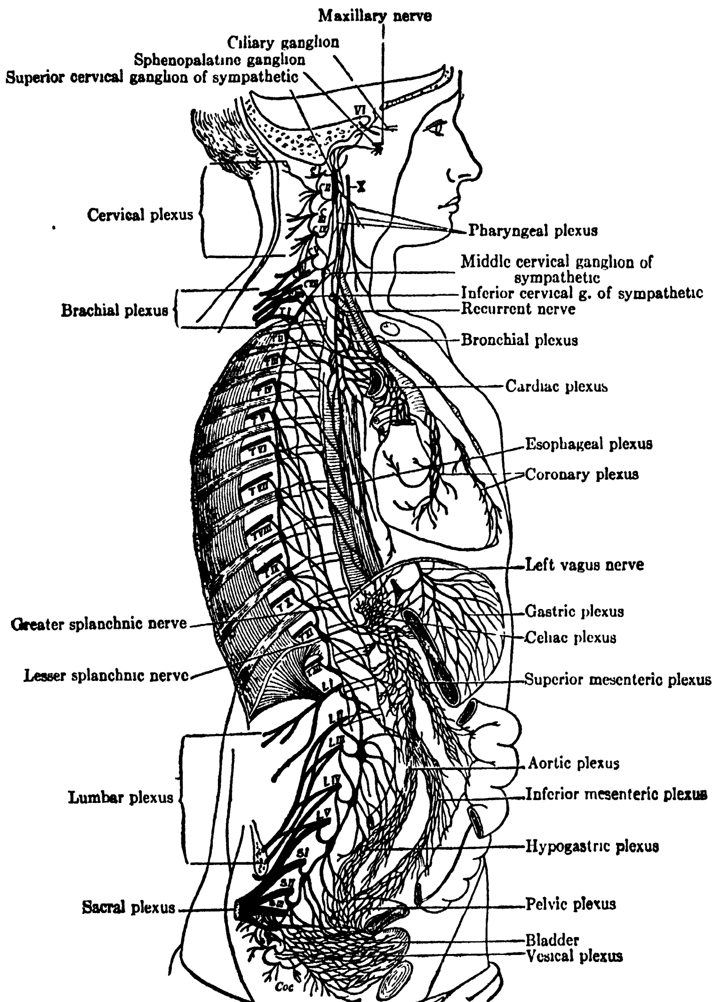


FIG. 59.—The autonomic (sympathetic) nervous system showing right sympathetic trunk, spinal nerves, and sympathetic ganglionated plexuses. (*Herrick after Schwalbe, Introduction to Neurology, W. B. Saunders Company.*)

The "new brain" or higher nerve center, in its most primitive form as the "nose brain" of the shark, is little more than an

elongation of the very large special organ of smell in the fish. In man the cerebrum, with its organ of thought, the cortex, has quite dominated, overshadowed, and, to some extent, replaced the autonomic or instinctive part of the behavior mechanism (Fig. 57).

In Fig. 58 the base of the human brain is shown with spinal cord and nerve roots attached. On the left are shown the ganglia

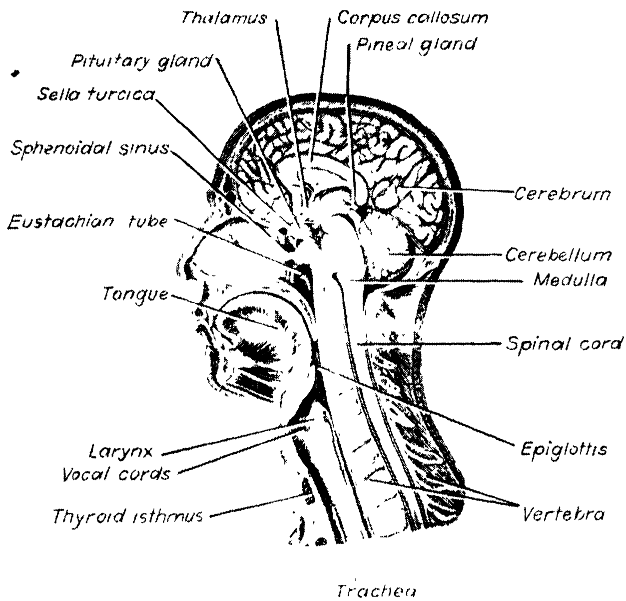


FIG. 60.—Median section of the head. (*Warren, Handbook of Anatomy, Harvard University Press.*)

of the autonomic system, illustrating the intimate way in which the two systems interact.

In Fig. 59 are shown the same structures seen from the side, and also the autonomic nerve supply to the various vital organs. In Fig. 60 the brain structures are shown in median section. The function of the old or lower system seems to be similar to that of the airplane mechanician who keeps the machinery oiled, fueled, and in running order, but who has no responsibility for, and not

necessarily even knowledge of, the destination of the plane. The cerebrum or higher brain is the pilot who does the thinking and the directing of the course. Under normal conditions the pilot gives no heed to the machinery itself and the mechanic no thought to where or how fast the plane is running. If something breaks or some mechanism gives trouble there is instant communication and conscious cooperation. If the pilot runs into a storm or sees an impending crash there is a reverse situation in which there is again intensive and conscious cooperative effort. Similarly, the new brain demands special and intensive action from the autonomic system in case of emotional emergency such as fright or anger (see page 136). The old brain, likewise (in most situations), sends SOS messages to the cerebral cortex if injury, chemical or mechanical, occurs to the vital structures under its control.

The cortex is well described by Dr. Parker in the passage quoted at the opening of this chapter. It consists of a delicate feltwork of outgoing, incoming, and intercommunicating fibers within the meshes of which are found the supreme accomplishment of nature up to the present time—the brain cells—more than 9 billions of them, and so small they might all be packed within the compass of a cubic inch. The cortex is approximately 1/10 inch thick and, if spread out flat, covers a surface about 16 by 20 inches. Truly a magic fabric!

The Health of the Autonomic Nervous System.—It is of basic importance to health and efficiency that the autonomic system be in good running order. This means efficiency in the organs regulating oxidation in the tissues; in the mechanisms regulating digestion and absorption of chemical food substances; and in those regulating neutralization and elimination of the waste products of biochemical activity. This means healthy chemical reactions as regulated by the endocrine glands and based upon a balanced and adequate food supply.

How worse than foolish it is deliberately to employ the new brain, the thinking center, to force into the blood stream chemical substances foreign to the natural biochemical composition of the body, which throw the mechanisms of life out of gear and make them unable to carry on their adjusted and regulated activities! This relates to narcotics, excessive sweets, and all other unnecessary or harmful substances (see pages 99–101).

The continuous and adequate functioning of the mechanisms of the body depends not only upon the chemical balances described under nutrition, but quite as definitely upon the chemical balances as affected by behavior. The chemical changes occasioned by fatigue are highly destructive, and may even bring the physiological and mental activities of the body to a standstill. Fatigue may be engendered by continuous activity of all parts and organs of the body or only of certain ones; by loss of sleep; by high-pressure living—operating the protoplasmic mechanisms at a faster rate than that at which chemical recovery can take place. Chemical imbalances are thus produced with temporary or lasting injury to the nervous system.

The emotions play a great role in body chemistry. It is now believed that thought and feeling are functions of the body-mind and are accompanied by chemical and electrical reactions or responses taking place within the incredibly complex mechanisms of the thalamus and cortex. The effect of emotion upon the autonomic mechanism may be violent enough to produce acute toxemia and metabolic imbalance. This is only another way of saying, "I was so angry I was sick," or "I was so sick with disappointment I could not eat." Nausea, vomiting, purging, fainting, and nervous chills, all physiological in character, may be produced by purely psychic experiences.

Mental Hygiene.—The health of the cortical or cerebral nervous system implies first of all (as has been repeatedly stated) optimal nutrition and physical health—a normal chemical situation in the organs regulated by the autonomic nervous system.[1] Secondly, mental health depends upon selecting wisely from the confusion of possible life experiences; in setting up and maintaining a sound and consistent philosophy of life, including early self-discipline in facing facts; and in trying constantly to see one-

[1] "Mental health, happiness, efficiency and social adaptation largely depend upon the nicety of balance between the modes of expenditure of the individual's energy in relation to biological needs and environmental demands and opportunities. If his management of his psychobiological functions is inadequate, erratic and uncertain, his personality, peace of mind, and social adaptation suffer accordingly. Expenditure of energy brings most satisfying returns when it energizes essential, well organized patterns of behavior." HOWARD and PATRY, *Mental Health*, p. 4, Harper & Brothers, 1935.

self from an impersonal point of view. Certain practical measures are discussed in Chaps. I and III, such as securing regular sleep, rest, and recreation. Ever and always must one increasingly become aware of the unity of the physical, mental, and social aspects of the organism, and of the fact that the whole individual reacts to the whole of every situation.

The college student who is habitually discouraged, envious or jealous of others, who indulges in self-pity, or who markedly shrinks from the usual social relationships should recognize that she is not reacting normally and effectively to life. No matter how handicapped she may be, economically, physically, or otherwise, she should have self-respect and a fighting spirit and find many compensations. If she is unable to rise above the situation by her own effort, she should, as previously advised, seek advice from faculty members, her clergyman, or other competent and sympathetic and experienced individuals. Merely telling one's troubles sometimes brings the answer to the situation. Continued repression and brooding are always destructive, and there always are those available who are glad to be helpful if the young person will give them opportunity.

References

Caldwell, Skinner, and Tietz: *Biological Foundations of Education*, Ginn & Company, 1931.

Douglas, A. C.: *The Physical Mechanism of the Human Mind*, E. S. Livingston, 1932.

Franz and Gordon: *Psychology*, McGraw-Hill Book Company, Inc., 1933.

Harvey, B. C. H.: *Simple Lessons in Human Anatomy*, American Medical Association Press, 1931.

Herrick, C. J.: *The Thinking Machine*, University of Chicago Press, 1929.

———: *Neurological Foundations of Behavior*, Henry Holt & Company, 1924.

Howard and Patry: *Mental Health*, Harper & Brothers, 1935.

Koffka, Kurt: *The Growth of the Mind*, Harcourt, Brace & Company, 1927.

Parker, G. H.: *Biology and Social Problems*, Houghton Mifflin Company, 1914.

Wheeler, R. H.: *Principles of Mental Development*, Thomas Y. Crowell Company, 1932.

White, W. A.: *The Meaning of Disease*, Williams & Wilkins Company, 1926.

New Terms in Chap. XVI

Amenorrhea. Cessation of menstruation or interruption of the menstrual cycle.

Coitus. Sexual intercourse.

Dysmenorrhea. Painful menstruation.

Fallopian tube. The oviduct or tube through which the ovum passes after its release from the ovary.

Fetus. The child while developing in the uterus.

Menopause. The normal termination of reproductive function in the female; "change of life."

Menorrhagia. Excessive menstruation.

Ovary. The organ in the female which stores and matures the ovum or egg.

Placenta. The organ of nutrition which is developed within the uterus following fertilization of the ovum. Its function is to convey nutriment and waste between the uterus and fetus by process of osmosis through its capillary walls.

Umbilical cord. The blood vessels connecting the placenta with the fetus.

Uterus. "The living nest" in which the ovum or egg is incubated during pregnancy.

Vagina. The collapsible muscular antechamber to the uterus within which seminal fluid is deposited during coitus.

CHAPTER XVI

THE REPRODUCTIVE SYSTEM

The organs of reproduction in the two sexes arise from a common embryonic nucleus which begins to differentiate into one sex or the other between the second and third months of fetal life. It is interesting that the male and female organs correspond part for part—a given group of embryonic cells developing into the male penis or into the female clitoris; another group into the female labia or into the male scrotum, etc.

The germ plasm of the individual is gathered together, so to speak, within the ovary of the female and the testicle of the male as these organs are formed in the embryo. The child at birth has, potentially, all the germ cells with the traits for all the children he or she can ever have. He passes along to his progeny by way of his own body organization what he has received from the past. The reproductive organs were created to provide a mechanism for accomplishing this end. The reproductive system, as described in the previous chapter, involves an exceedingly complex glandular mechanism which stimulates, regulates, and controls all the functions and activities of the reproductive organs and other organs as well. The reproductive organs of the female are carried within the body in such a way that they are protected against almost every conceivable injury from infection or violence. A glance at Fig. 34, the skeleton, will show how the basin of the pelvis is shielded by the projecting rim of the hip bones and by the protruding hip joint. A glance at Fig. 61 will show what a devious journey any foreign matter, such as disease germs, would have to make to reach the ovary.

We have seen that the sex hormones play a powerful part in the physical and mental life of the individual from the moment the sex functions are thrown into glandular "gear" at the time of puberty. In the female, from that time until the menopause (change of life) the pituitary clock ticks off the menstrual or

estrous cycles. Once about midway of the menstrual cycle (which usually is 28 days, but may be normally another number in individual women) a pituitary hormone causes the ovum to mature (see page 126) and leave the ovary. The calyx-like fimbriated extremity of the Fallopian tube (oviduct) picks it up, and it is propelled to the uterus by the wavelike movement of the cili-

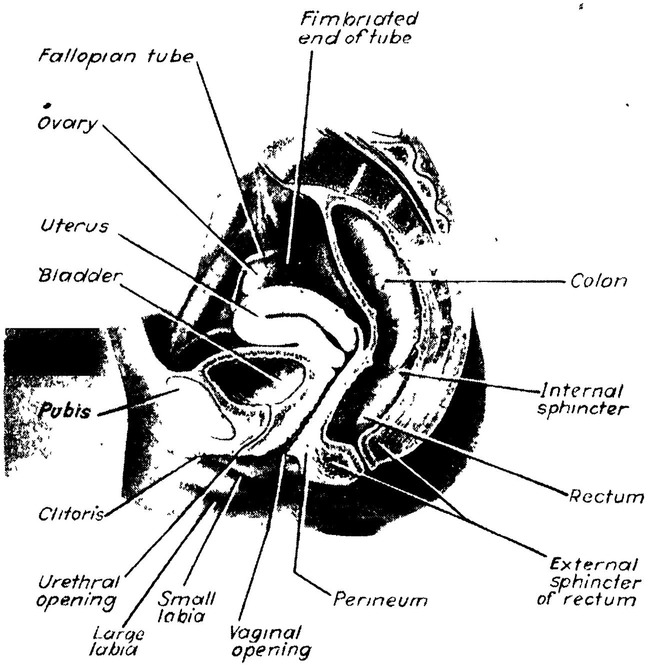


FIG. 61.—Sagital section of the female pelvis. (*Warren, Handbook of Anatomy, Harvard University Press.*)

ated lining of the tube. The journey through the tube probably consumes several days; estimates vary from 3 to 7. It is only while an ovum (egg) is in the tube that fertilization can occur and pregnancy result (Fig. 62). The male sperm cells are deposited in the vagina at the time of sexual intercourse (coitus). The sperm cells (spermatozoa) are very motile and find their way against the wavelike movement of the walls of the tubes, doubt-

Duration	1 to 5 days	6 to 14 days	15 to 28 days	10 menstrual periods	7 to 9 months
Period or phase	Menstruation	Postmenstrual (repair)	Premenstrual (preparatory)	Pregnancy	Lactation
Changes in ovary	Old corpus luteum atrophies.	New follicle forming, new ovum maturing.	Graafian follicle becomes new corpus luteum.	Corpus luteum increases in size and function until the last of pregnancy when it regresses.	Ovaries and ova quiescent. Ovulation occasionally returns during lactation.
Changes in uterus	Congestion drains away in menstrual flow.	Lining of uterus undergoes repair.	Lining becomes congested.	Uterine part of placenta forms. Uterus enlarges.	Uterus returns to normal (involution 4–6 weeks). Quiescent until ovulation returns.
Glands active	Posterior pituitary.	Anterior pituitary. Graafian follicle.	Anterior pituitary Corpus luteum	Anterior pituitary. Corpus luteum Placenta. Posterior pituitary at birth of child.	Anterior pituitary. Mammary gland.
Hormones in control	Pituitrin (pitocin).	Gonadotropic hormone of anterior pituitary (prolan A). Folliculin, (theelin, female sex hormone).	Gonadotropic hormone of ant pit. (Prolan B) Corpus luteal hormones (progestin)	Prolactin (ant pit.). Progestin (corp lut) Prolaxin (corp lut) Placental hormone. Placental chalone Pitocin at the last.	Prolactin (ant. pit.) Mammary chalone restrains ovulation.

Follicle ruptures: ovum escapes (ovulation)

Birth of child

FIG. 62.—Menstrual and pregnancy cycles and lactation.

less in response to powerful hormone attraction. The egg and the sperm meet, normally, within the Fallopian tube. If union (fertilization, conception) occurs the egg begins at once to develop and moves on to the cavity of the uterus, where it lodges and where the various changes of pregnancy proceed, regulated by estrin (theelin), and progestin (see pages 138–139). The sperm remain alive within the uterus and tubes for an indefinite period, estimated from hours to days; there is no way of knowing just how long. It would seem that sexual intercourse, in order to be fruitful, must occur during the time an egg is in a tube or within so short a time previously that the sperm remains alive within the tract until ovulation occurs.[1] Some authorities, however, claim that conception may occur at any time.[2]

The fetus develops within the uterus and is nourished through a special organ of nutrition called *the placenta,* which is made up largely of a branching mass of veins, arteries, and capillaries. The capillaries of the placenta mingle with the capillaries in the wall of the uterus and exchange waste for nutriment by osmosis. There is no direct connection between mother and child. Pure blood is conveyed passively to the fetus from the placenta through a vein in the umbilical cord, and used blood returns to the placenta, after circulating through the body of the fetus, through two arteries contained within the cord (Fig. 63).

At the middle of pregnancy the uterus rises in the abdomen, because the growing fetus requires more room. At the termination of ten potential menstrual cycles, a radical readjustment of hormone control takes place; the pituitaries again function actively, the corpus luteum ceases functioning, and the child is forcibly expelled from the uterus (see page 127); the milk flow

[1] EMGE, L. A., "The Safe Period," *Western Journal of Surgery, Obstetrics-Gynecology*, January, 1926. Abstracted in *Journal of the American Medical Association*, Mar. 14, 1936.

LATZ, LEO J., "Natural Conception Control," *Journal of the American Medical Association*, Oct. 19, 1935.

CARY, WILLIAM H., "Duration of Sperm Cell Migration in Uterine Secretion," *Journal of the American Medical Association*, June 27, 1936.

WIGGERS, CARL J., *Physiology in Health and Disease*, Lea and Febiger, 1934.

[2] ARAYA, R., "Is There a Period of Physiologic Sterility in Women," *Journal of the American Medical Association*, Dec. 5, 1936.

starts (under regulation from various endocrines, see pages 126–139), and a new phase of life begins for all concerned.

Normal Sex Life.—So well has nature accomplished her evolutionary purpose of perpetuating life that functioning of the sex glands normally stimulates all the physical and mental activities of the individual. Most women feel increased vigor and exhilaration during the greater part of the period of pregnancy. Under

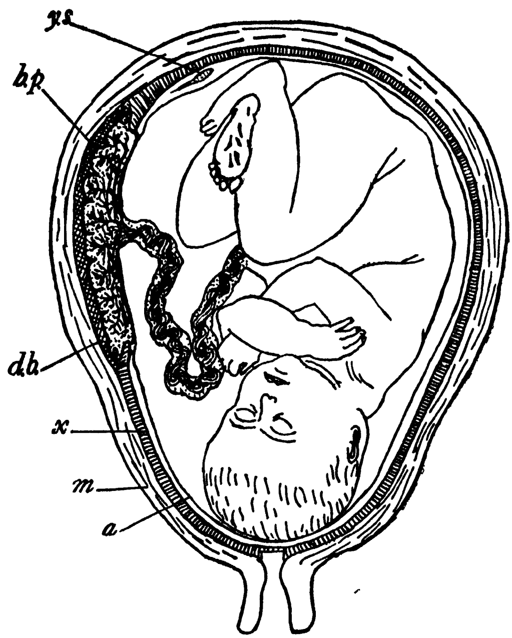


FIG. 63.—Diagram of uterus near end of pregnancy, showing placenta, membranes, and cord. (*After Wieman, An Introduction to Vertebrate Embryology, McGraw-Hill Book Company, Inc.*)

the stimulus of sex hormones and sex attraction a great deal of the creative work of the world is accomplished, some theorists would say all. Sex attraction is for the individual during much of life the most profound and compelling of all social forces and physiological urges. It must be remembered, however, that there is a balanced sex life, just as there is balanced nutrition. Sexual excess, in or out of marriage, upsets and destroys the harmonious working of the moving, thinking, feeling body-mind just as

definitely as sitting down and devouring a pound of candy because one piece tastes good upsets the nutritional balance.

The question, what constitutes balanced sex life, is now so much a matter of opinion that it would be presumptuous to make dogmatic statements. This will have to be worked out, as other subjects of personal and social importance are being solved, on a basis of the finest intellectual and emotional approach. It must be solved by the joint effort of the two sexes, clarified by thoroughly scientific method, and, possibly, studied according to criteria and controls yet to be developed. The problem is one of the bequests of the baffled present generation to the next! For the present young people will do well not to break away too abruptly and too definitely from the sanctions and restrictions of the past. A list of helpful references is given at the end of the chapter.

Menstruation, as explained in Chap. XIV, page, 139 consists in the escape of the nutritive material which has accumulated within the congested walls of the uterus under the stimulus of the hormones of the Graafian follicle and the corpus luteum. Preparation for the nutrition of a fertilized egg occurs during the journey of the egg through the tube. If it does not meet a sperm the preparation has been in vain, and the pendulum of the pituitary clock swings back, the corpus luteum shrivels up, and menstruation occurs.

Menstruation (the onset of which is the sign that ovulation has begun and that pregnancy is possible) may (rarely) begin as early as ten years and continue as late as fifty years. The average age at onset is twelve to thirteen and the average age for the menopause is forty-five to forty-seven. Delicate girls tend to begin to menstruate later than robust girls, and also tend to pass through an initial period of irregularity and to experience an early "change of life" (menopause).

The hygiene of menstruation is a repetition of the rules of all personal hygiene. (1) Nutrition here, as elsewhere, is basically important. In Chaps. IX and X we noted that certain of the vitamins and minerals are essential to all glandular function, including that of the reproductive glands. Certainly vigor and strength of every sort underlie vigor of the pelvic organs. (2) Good body mechanics is nowhere more important than in relation

to the pelvic organs. Posture and exercise directly affect these structures for good or for ill. It is now believed that it is better to consider menstruation as a perfectly normal function and ignore it to the extent of going along with one's regular program of work and activity.[1] It is not prudent to take up new or excessively taxing physical activities. (3) Going about one's business includes a daily bath, but one should avoid surface chill and unusual or extreme exposure to wet or cold. This does not mean coddling; it merely means prudence and common sense. (4) The aesthetics of management of this trying phenomenon deserve discussion, particularly in view of the present craze for a "slim, clean silhouette." The commercial world has placed all womenkind in its debt by releasing them from age-long drudgery through the provision of convenient sterile, absorbent napkins. The latest fad, however, the internal absorbent pad, is, in the opinion of the author, unhygienic and injurious and is most emphatically to be condemned. Unnatural pressure with prolonged retention of rapidly disintegrating organic matter cannot help having injurious consequences. Just what consequences, and how injurious they may be, it is too early to say. Certainly internal absorbents should never be used during the first days of the period and never at night.

Vaginal douches should never be used unless expressly ordered by a physician for a special purpose. It may seem reasonable to think that a cleansing irrigation at the end of menstruation is desirable. Nature has provided, for this purpose, mucous secretion which is of exactly the correct chemical composition, consistency, and temperature. Moreover this secretion flows from above outward, while the douche reverses this and tends to force the waste material into the uterine canal, as may be seen by looking at the structures in Fig. 61.

The use of antiseptic douches, especially some which are widely advertised for "purposes of feminine hygiene," cannot be too emphatically condemned. All meddling with these highly specialized structures may set up trouble near or remote (see

[1] BILHUBER and POST, *Outlines in Health Education for College Women*, A. S. Barnes & Company, 1928.

RAMSEY, MURIEL, "The Effect of Exercise on Menstruation," *The Medical Woman's Journal*, December, 1935.

page 253). For contraceptive purposes (prevention of conception, "birth control")—one gathers from the thinly veiled advertising that these powerful antiseptics are recommended for this purpose—irritating solutions should never be used. Advice from a highly conscientious medical specialist is the only safe guide.

Painful menstruation (*dysmenorrhea*) is far too prevalent among young women, although the author ventures to hope it is becoming less common with their increasing activity and, in some respects, better selection of food. Painful menstruation may be due to many different causes among which may be considered the following. (1) Underdeveloped or infantile uterus is a condition found in some undernourished girls who, it would seem, do not have physiological vigor at the time of puberty sufficient to achieve full development. This is more or less complicated by endocrine imbalance. (2) Displacement of the uterus may impair free drainage. This may occur from sitting falls or other injury or from habitual faulty posture. (3) Pressure from impacted fecal matter in the colon, which closely surrounds the uterus, may cause painful menstruation. (4) Free drainage may be impeded also by an abdomen relaxed from continued sitting and lack of exercise, a condition in which the pelvic organs become chronically congested and debilitated. (5) Another cause for acute pain is surface chill from sitting with cold, wet feet, sitting in a draft when sweating, or going into the cold with too little clothing upon the feet, legs, and abdomen. Surface chill drives the blood from the skin into the internal organs and intensifies the congestion of the uterus.

Treatment of painful menstruation should first of all be directed toward finding and correcting the cause. Unfortunately, there has been far too little medical research in this very important field. There is too great an inclination on the part of some physicians to treat dysmenorrhea as a minor ailment and give temporary pain relief, perhaps with the more or less comforting (and largely true) statement that all difficulty will probably disappear with the first pregnancy! For some the first pregnancy never comes, and for all it is too long to wait!

Any young woman who is afflicted with dysmenorrhea as a regular experience and who has not been able to obtain relief

through correction of her health habits and through exercise should, by all means, seek a medical specialist who will take the matter seriously and will make a determined effort to discover and treat the cause. If the cause is displacement it can readily be corrected. If it is underdeveloped organs it is well worth while to try treatment with endocrine extracts *at the hands of a specialist.* While this type of therapy is not entirely through the experimental phase, it is in certain cases the one logical sort of treatment, and is showing increasing success

Physical hygiene is all-important in every instance. Correction of diet and bringing one's nutrition up to normal will, alone, cure

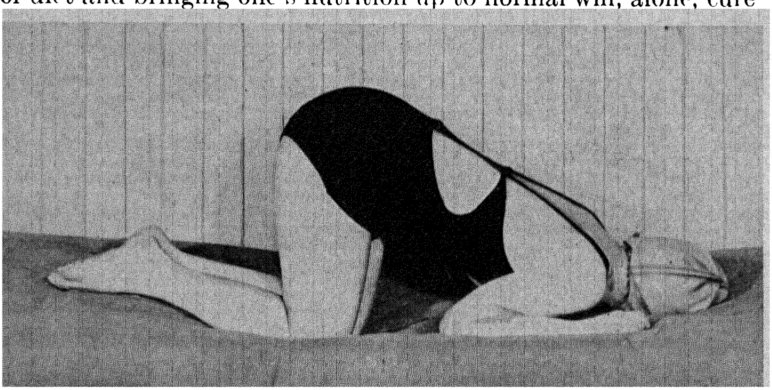


Fig. 64.—The knee-chest position.

a good many cases. Poor drainage and displacement may be improved by the adoption of an active personal regime as advised in Chap. V and in persistently practicing the two corrective exercises shown in Figs. 64, 65, and 66. The *knee-chest position* is probably the oldest corrective exercise known in medicine, being described as far back as there is literature upon pelvic therapy. The effect is, as one can see, to throw the organs up into place, relieve them from pressure, and make free circulation possible. This position should be taken after going to bed, when one will not get up on the feet again until morning, and held for 10 to 15 minutes or as long as it is comfortable. In the morning before arising one may advantageously practice the *Mosher pumping exercise,* which invigorates and exercises the abdominal contents. The contractions should be vigorous and repeated

from 20 to 50 times, according to circumstances. This exercise was invented by Dr. Clelia Mosher, for many years director of physical education for women in Leland Stanford University. Dr. Mosher devised the exercise as a corrective for the very

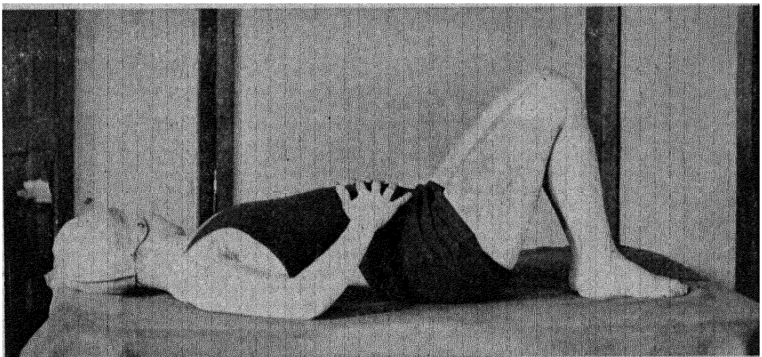


Fig. 65.—The Mosher exercise. Position A.

prevalent lack of abdominal tone in women students as shown in constipation, sluggish drainage and pain in menstruation, and fatigue posture. The "Mosher exercise" has come into widespread use and is valuable as a general organic tonic.

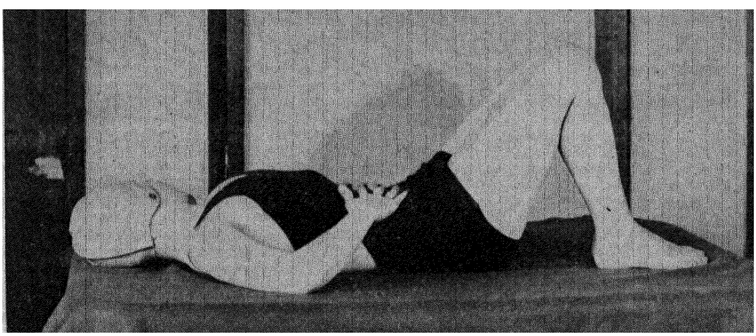


Fig. 66.—The Mosher exercise. Position B.

Missed periods (*amenorrhea*), as a rule, should give no concern on account of the menstrual function itself, and nothing should be done to force the menstrual flow. The nonappearance of the menstrual flow is protective and is practically always (in the

absence of pregnancy) a sign that the physical reserve of the body is depleted. The whole concern should be to build up a condition of normal health and vigor, whereupon ovulation will again occur.

Women students frequently miss periods on first entering college, particularly if thrown into a life of social strain, sorority rushing, and loss of sleep. Many women react in this manner to any radical change of regime, such as travel or taking up new work. The situation should not be neglected for it is nature's warning that the personal life of the individual is not meeting the normal needs of the body.

Excessive menstruation (*menorrhagia*) should always be brought at once to the attention of a discerning physician. It sometimes happens that the protective mechanisms of the body do not work, and, instead of being spared under strain, the individual menstruates too much or too often. Local derangements such as tumor or infection may also cause this. Excessive loss of blood is always depleting and should never be neglected. Correction of health habits with increased rest and avoidance of physical strain will often straighten out the situation and is always basic to effective medical treatment.

Irregular periods frequently occur at the onset of the menstrual function. Within a year, certainly, the rhythmic cycle of the individual should be established, and, except for the interruption of pregnancy, should continue throughout the potential childbearing years.

In general, health of the reproductive system is only one aspect of health of the entire organism. Every normal young woman will covet optimal health, vigor, and competency, and will set out to accomplish the realization of the complete life which is possible for every living being not born with irremediable handicaps—and these are very few.

References

Araya, R., "Is There a Period of Physiologic Sterility in Women?" *Journal of the American Medical Association*, Dec. 5, 1936.

Bilhuber, Gertrude: *The Effect of Functional Periodicity on the Motor Ability of Women in Sports*, Purdue University, 1926.

Bilhuber and Post: *Outlines in Health Education for College Women*, A. S. Barnes Company, 1928.

CARY, WILLIAM H.: "Duration of Sperm Cell Migration in Uterine Secretion," *Journal of the American Medical Association*, June 27, 1936.

EMGE, L. A.: "The Safe Period," *Western Journal of Surgery, Obstetrics-Gynecology*, January, 1936. Abstracted in *Journal of the American Medical Association*, Mar. 14, 1936.

ETHRIDGE, MAUDE LEE: *Health Facts for College Students*, W. B. Saunders Company, 1933.

FATHERREE, IRENE: "The Value of Systematic Exercise for Constipation and Dysmenorrhea," *Medical Woman's Journal*, December, 1924.

GREGORY, JENNIE: *The A. B. C. of the Endocrines*, Williams & Wilkins Company, 1935.

LATZ, LEO J.: "Natural Conception Control," *Journal of the American Medical Association*, Oct. 19, 1935.

MILLER, NORMAN: "Additional Light on the Dysmenorrhea Problem," *Journal of the American Medical Association*, Dec. 13, 1930.

MOSHER, CLELIA D.: *Personal Hygiene for Women*, Leland Stanford University Press, 1927.

NOVAK, EMIL: "Menstruation and Menstrual Disorders," *Journal of the American Medical Association*, Feb. 4, 1928.

——: *The Woman Asks the Doctor*, Williams & Wilkins Company, 1935.

PHILLIPS, LEONARD: "Treatment of Dysmenorrhea with Analysis of One Hundred Cases," *Medical Woman's Journal*, January, 1924.

RAMSEY, MURIEL: "The Effect of Exercise on Menstruation," *The Medical Woman's Journal*, December 1935.

TAUSSIG, F. J., *Abortion*, pp. 70–77, C. V. Mosby Company, 1936.

VAN BLARCOM, CAROLINE: *Getting Ready to Be a Mother*, The Macmillan Company, 1929.

WIGGERS, CARL J., *Physiology in Health and Disease*, Lea and Febiger, 1934.

CHAPTER XVII

PUBLIC HEALTH AND THE FAMILY

The family is dependent upon the community and the state for certain important health protections, and the family, in turn, must cooperate with and support all public health organizations in order to derive complete benefit. The young couple, therefore, should make themselves acquainted with the local ordinances and state laws bearing upon the health protection of their new home and should become intelligently informed as to modern public health standards. They should actively support whatever in the existing situation is meritorious, and actively work for improvement when conditions could and should be improved.

The public health protection of the family may be considered under the following subjects: Food and Sanitation; Communicable Diseases; Diagnostic Service; Dispensaries, Clinics, and Hospitals; Medical Service for the Indigent; Public Health Nursing; Health Education.

Food and Sanitation.—The family food supply should, first of all, be protected by the state through effective legislation regulating food adulterations; exposure and sale of foods; municipal water supplies, sewage disposal, and public waterways; tuberculin testing of milk herds, milk standards, dairy inspection; the provision of adequately trained state dairy and food supervisors; the licensing of all food purveyors; the compulsory medical examination of all food handlers.

The local official health organization should enforce the state laws and supplement these by securing the passage of such municipal ordinances as may be necessary to obtain full protection for the citizens of the community. In many states which have fairly adequate state laws, the machinery for administration is inadequate, particularly with reference to the number and qualification of its official supervising sanitarians. Often the municipality will need to maintain its own Department of Health with a full-time trained public health officer at the head. The

department will need to maintain a municipal laboratory with technicians and sanitary officers (according to size of the town) sufficient to maintain continual oversight of the water plant, the milk supply, and local manufacture and distribution of food, such as in bakeries, restaurants, ice-cream factories, milk distribution plants, canning and preserving establishments.

If the state does not require the medical examination of food handlers it is, in most states, possible for the municipality to pass ordinances providing for a periodical medical examination by the local health officer. When such an ordinance is passed the first compulsory round-up of food handlers usually discovers disease carriers, syphilitics, active tuberculars, and persons with communicable skin conditions among dairy hands, dishwashers, and cooks.

Local food inspection should cover the back premises of groceries and meat markets. It would be a revelation to the fastidious housewives in many communities to discover how many such establishments do not have any provisions for washing the hands with warm water and soap, or drying them with paper towels. The toilet facilities are often shocking, and rats, mice, and cockroaches may abound.

Milk is such an important item of the family dietary, particularly with children, that parents should personally investigate the dairies and milk plants before deciding upon the ones they will patronize. They should take an active interest in the general milk situation and promote the adoption and enforcement of a standard milk ordinance. Provisions of the standard ordinance endorsed by the United States Public Health Association, the American Medical Association, and the Conference of State and Provincial Health officers are given in condensed form below.

1. Every person selling milk must be officially registered and be assigned a number which must appear upon his vehicle of delivery.

2. Each and every cow must be tuberculin tested and tagged as healthy and satisfactory by a registered veterinarian and officially numbered and registered with her description in the books of the health department.

3. It shall be unlawful to sell milk which contains any preservative, water, or visible dirt.

4. Milk offered for sale must contain at least 8.5 per cent of solids other than fat and at least 3.25 per cent of milk fat.

5. Raw milk offered for sale shall not contain more than 50,000 bacteria per cubic centimeter by standard plate count.

6. All containers must be sterilized with live steam or by other approved method before being used.

7. Milk must be cooled to 50° or below immediately after milking and be kept at this temperature until delivered and must not be changed from one container to another.

8. The city board of health shall employ a trained milk inspector and provide a properly equipped laboratory. The supervisory official shall make a monthly report of all dairies under his supervision to the city council or commission.

9. Before a dairy is given a license all dairy employees and all persons living upon dairy premises must have laboratory examination by the local health officer of feces and urine over a period of time necessary to determine that there are no typhoid carriers upon the premises.

10. The ordinance also regulates bottling, labeling, delivering, pasteurizing, etc., and defines grades A, B, C, and D for uncertified milk and grades A, B, and C for pasteurized milk. Standards are stipulated for barns and equipment for all dairymen and producers. Penalties are provided for infringement of these provisions.

Good water supply is of the utmost importance. The water the family drinks must not only be free from contamination with disease germs and from definitely injurious chemical ingredients, it must also have a palatable flavor and appear clear and sparkling, or individuals will not drink enough to keep themselves in optimal health. The water content of the body is vital to its function and well-being (see Chap. XII). It has been noted that the installation of an approved water system in a community is followed not only by a drop in the incidence of water-borne infections such as typhoid and dysentery, but also by an improvement in the general health and lessening of mortality from other causes, obviously because the general health of the population is improved by drinking more water and better water. It therefore becomes the duty of the new homemakers, if they are using municipal water, to investigate the local water supply. They

should ascertain the legal state standards, the frequency and method of inspection, and then find out the source of the local water supply and the method of treatment. It will depend upon the source as to what treatment it should receive. Surface water from a river or shallow lake will require more extensive treatment and more frequent testing than will ground water from deep wells or from the bottom of deep lakes or reservoirs. Surface water usually requires: aeration by exposure to air through spreading the water in a fine sheet or spray as it falls over shelves or is sprayed into the air; filtration through sand; coagulation and precipitation of organic matter and bacteria through the addition of alum or other coagulant; softening through chemical precipitation of the calcium and magnesium salts which form the well-known curd with soap; finally, the addition of a disinfecting chemical such as chlorine gas in the amount required to keep the bacterial count below the official limit.

The municipal sewage disposal must be adequate and of such a character that it does not contaminate any water supply if sewage is discharged into a body of water, and such that it does not constitute a local nuisance in the way of breeding flies or giving off offensive odors, if sewage beds are used. For the small inland town and for the unsewered home some form of septic tank is probably the method of sewage disposal of choice.

The sanitation of the isolated home is a peculiar responsibility, requiring intelligent appreciation of the details of proper management.

The home which must provide its own water supply through excavated or driven wells or cisterns calls for personal attention on the part of the owners, who should know at all times that the water is free from contamination and is of satisfactory quality. Surface water from rains may convey infectious matter from great distances into water veins and thus into even fairly deep wells. Rain water washes into cisterns the infected dust blown to roofs by the wind unless effective and frequently cleaned filters are provided. The wall and top of any well should be watertight and well above surface drainage, otherwise serious contamination may occur.[1] Water from all private water supplies should be analyzed

[1] *Good Water for Farm Homes*, Public Health Bulletin No. 70, U. S. Public Health Service, Washington, D. C.

in a water laboratory after droughts and floods and at other periodical intervals.

Outdoor toilets should be screened, scientifically constructed, and frequently renovated.[1] Septic tanks minimize fly breeding, odors, and danger from infection.[2]

Garbage disposal is important because the exposure of organic matter either fresh or decayed attracts insects and rodents and decaying organic matter supplies breeding places for flies. Where municipal collection and disposal are not provided, burning or burying is the best method for the householder.

Community sanitation extends, not only to sewage and garbage disposal, but to the cleaning of streets and alleys, the control of domestic animals, the regulation of outdoor toilets, and the control of industrial smoke and odors.

Control of communicable diseases is possible only where a completely adequate Public Health Unit is maintained in the city and county. Disease germs are no respecters of persons, and the rich child from the good home is not safe unless the poor child whom he meets in school and upon the street is fully protected. Prevention of communicable disease requires, first of all, prompt discovery and isolation of all cases through quarantine or placard; secondly, widespread education as to prevention and, especially, utilization of the vaccine and serum immunizations the success of which have been conclusively demonstrated, notably immunization against diphtheria, smallpox, and typhoid (see Chap. XVIII). To carry out such a program, a full-time health officer, a sufficient staff of public health nurses, and access to a diagnostic laboratory are necessary.

To carry out any program of community control of contagions it is further necessary to have a Board of Education and a School Administrator who fully cooperate with the Department of Health in the immunization and quarantine programs and in the exclusion of colds and all incipient contagions from school (see page 222).

The public health clinics such as *well-baby clinics* for advising mothers in the care and feeding of young children; *prenatal*

[1] *The Sanitary Privy: Its Purpose and Construction,* Public Health Bulletin No. 37, U. S. Public Health Service, Washington, D. C.

[2] *Sanitary Disposal of Sewage through a Septic Tank,* Reprint No. 625, U. S. Public Health Service, Washington, D. C.

clinics; diagnostic clinics for orthopedic, medical, nervous and mental, eye, ear, nose, and throat, and other special classes of cases, such as tuberculosis and venereal disease, are essential to any complete program of community health.

Free dispensaries and treatment clinics are necessary in many communities to provide adequate care for the indigent, both to protect the rest of the population and also to safeguard the inalienable right to health which should belong alike to rich and poor.

Hospital service for general medical care, *sanatoria* for the isolation and treatment of tuberculosis, and *preventoria* for underprivileged, pretubercular children should be available according to the need of each community.

Free medical service for the indigent in their own homes should be provided and should be equal to the best in amount and quality.

School health should be the joint responsibility of the Board of Health, the Board of Education, and the school patrons. A complete program of *health examination, immunization,* and, to the extent necessary, *treatment,* should be carried on in the public schools through the agency of school physicians and school nurses. *Health education* should permeate the curriculum, just as morals and aesthetics should permeate every subject throughout every day. The provision of correct sanitary conditions in the school buildings, complete equipment for recreation and exercise, the provision of food when necessary to maintain proper standards of nutrition among schoolchildren—all enter into the school health program.

The Board of Health, the school, and the Parent Teachers Association should perpetually carry on health projects in adult education covering all the subjects mentioned and also education in the factors of individual nutrition, growth, and resistance to disease.

On page 489 of *Preventive Medicine and Hygiene* Dr. Rosenau presents the Chapin Score Card for the evaluation of the public health work in any community. It represents more or less valid effort to state the relative values of the different items of a complete program and is here given because it affords a rather graphic summary of public health work, rather than because the figures should be strictly followed.

Relative Values of Health Work

Communicable diseases	Medical inspection		100
	Hospitalization		50
	Immunization		50
	Venereal diseases		20
	Tuberculosis	Nurses	60
		Dispensaries	40
		Hospitalization	40
Child hygiene	School inspection		80
	Infant mortality	Nurses	80
		Supervision of midwives	10
		Boarding homes for children	5
		Milk stations	5
		Consultations	20
		Prenatal clinics	10
Sanitation	Privy sanitation		110
	Housing		20
	Plumbing		10
	Nuisances		10
	Fly and mosquito control		10
Food	Adulteration		0
	Sanitation		10
Milk	Adulteration		3
	Sanitation		17
Care of sick poor			50
Laboratory			50
Education			80
Vital statistics			60
			1,000

The young homemakers should realize that any community is merely the sum of homes and citizens such as they. They will find it well worth while to inform themselves and take an active part in the community life, particularly in matters bearing directly upon the health and well-being of all.

References

Crumbine and Tobey: *The Most Nearly Perfect Food*, Williams & Wilkins Company, 1929.

Rosenau, Milton J.: *Preventive Medicine and Hygiene*, D. Appleton-Century Company, Inc., 1931.

———: *Milk in Its Relation to Public Health*, Williams & Wilkins Company, 1929.

Sherman, H. C.: *Food Products*, 3d ed., The Macmillan Company, 1933.

U. S. Public Health Service: *Good Water for Farm Homes*, Public Health Bulletin 70.

———: *The Sanitary Privy: Its purpose and construction*, Public Health Bulletin 37.

———: *Sanitary Disposal of Sewage through a Septic Tank*, Reprint 625.

———: *Second Report of the Commission on Milk Standards*, Report 28.

White House Conference on Child Health: Vol. XVII, *Milk Production and Control*, D. Appleton-Century Company, Inc., 1932.

UNIT II
THE COMMON DISEASES

New Terms in Chap. XVIII

Agglutinin. An immunizing antibody which causes bacteria to clump in clusters or agglutinate.

Alexin (complement). A factor found in normal blood which is essential to the action of certain immunizing antibodies.

Antibodies. Chemical factors which may be natural or may be acquired by immunizing inoculations, which counteract or combat bacteria or other antigens.

Antigen. Any substance which causes the formation of antibodies, as disease germs, snake venom, horse serum, etc.

Antitoxin. Antibodies which neutralize the toxins created by certain disease germs, such as diphtheria and scarlet fever.

Bacteria. Microscopic organisms belonging chiefly to plant or preplant forms. The greater number of disease-producing germs are bacteria.

Botulism. The toxins of a variety of saprophytic microorganism which develop in plant and animal food in which slight disintegration has begun, but not sufficient to cause change in taste or odor.

Cocci (singular, coccus). Bacteria having round or spherical shape.

Complement. Same as alexin.

Diplococci. Cocci which tend to go in pairs.

Exudate. A discharge or secretion which oozes or "exudes" from a surface or tissue.

Filtrable virus. A microorganism so small that it has not been possible to filter it from a solution or see it under the highest powered microscope.

Flagellum (plural, flagella). A "whiplike" process or cilium attached to many unicellular organisms whereby they move about.

Formalin. An antiseptic solution prepared from formaldehyde.

Immunity. That condition of the body in which it is resistant to or antagonistic to disease.

Inoculation. The introduction of an antigen into the body for the purpose of setting up resistance to the antigen or disease through the formation of antibodies.

Lysins. Antibodies which cause antigens to dissolve or disintegrate.

Microbes. Microscopic organisms; commonly applies to disease-producing bacteria or germs.

Opsonin. A substance in normal blood which causes antigens to be engulfed by phagocytes or white blood corpuscles.

Parasites. Organisms which live upon other living organisms.

Pathogenic. Causing disease.

Phagocytes. One-celled ameboid cells found in blood, lymph, and reticulo-endothelial tissue which engulf and absorb disease germs and other foreign substances.

Precipitin. An antibody which causes bacteria or other antigens to precipitate in the serum.

Protozoa. Microscopic organisms which are classed as belonging to the animal kingdom.

Reticulo-endothelium. The name given to cells having characteristics both of reticular tissue and of endothelial tissue. These cells have important functions in blood chemistry and in antibody formation.

Spirilla (singular, spirillum). Bacteria having spiral form.

Staphylococci. Cocci which tend to collect in grapelike clusters.

Streptococci. Cocci which tend to form in chains.

Toxemia. A condition produced in the body by the presence of toxins.

Toxins. Poisonous substances produced by bacterial action; also toxins are found in snake venom and in some plants.

Vaccination. The inoculation of a vaccine for the purpose of immunization.

Vaccine. A suspension of dead or attenuated bacteria used to immunize against disease.

Venom. A poison normally secreted by a snake, insect, or other animal.

CHAPTER XVIII

INFECTION AND IMMUNITY

The Cycle of Life.—The body, as we have seen in previous chapters, is essentially a living chemical machine—a protein engine, which burns food-fuel and transforms it into energy. It also does something no nonliving mechanism can do, it builds and repairs its own structure and produces others in its own likeness.

Since life ever battles with environment and since life ever preys upon life, living protoplasm is forever returning to the elements of the earth from which it was created, and rising again to breathe and move in other organic forms (Fig. 67). While the mystery of this transformation is yet unfathomable, the steps in the process have been observed by scientists and are now described as constituting three phases. First *preplant* and *plant* forms (*bacteria*) arise which are able to synthesize (organize or create) living matter out of the 18 elements listed on page 65 as entering into the structure of living protoplasm. Warmth, moisture, and sunlight are essential to this process. Some plant forms (parasites) also utilize organic matter as food. Second, *animal* forms (*protozoa*) arise which cannot synthesize the elements as found in the earth, but must use them in organic form as prepared by plants. So the animal uses plants or other animals for food.[1]

[1] "Plant-carbohydrates and plant-proteins are the only vehicles by which carbon and nitrogen can enter the animal kingdom. They must be taken to pieces by the enzymes of the herbivore's gut before they can pass through into the real interior of its body, but the pieces must not (save in some protozoa) be of simpler chemical nature than sugars and amino acids. Carbon or nitrogen presented to an animal in any simpler form is as useless as a pile of banknotes to a man on a desert island.

"Once the carbon and nitrogen have entered upon their animal career, they can continue to circulate in the animal kingdom as carnivore [meat-eating animal] preys on herbivore [plant-eating animal] and one carnivore on another. In the process, however, the complexity of the carbon and nitrogen-carrying compounds never falls below the level of simple sugars and amino acids."

WELLS, HUXLEY, and WELLS, *The Science of Life*, p. 963, "The Chemical Wheel of Life," Doubleday, Doran & Company, Inc., 1931.

Third, since no organism has yet been able to maintain a perfect chemical balance in the struggle for existence, eventually all vital activity comes to a standstill and the organism dies. When death comes to a plant or animal, it becomes necessary for its constituent elements to return to the earth whence they came and become available for other life.

As living protoplasm arose slowly from the earth, so dead protoplasm would, eventually, over long aeons of time, become slowly oxidized and disintegrated and returned to the earth. This would be so slow a process, however, that all the available elements essential to protoplasmic structure would become transformed, via transient living forms, into dead but undecayed organic matter.

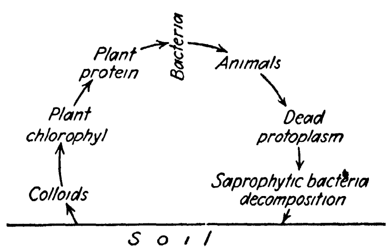


FIG. 67.—The cycle of life.

Therefore, as nature speeded up the matter of producing life by creating green plants, so she has speeded up the matter of returning dead matter to the earth, and thus completing the life cycle, by creating *saprophytic bacteria.*

These lively chemical microorganisms proceed to take dead protoplasm to pieces, so to speak, each species taking care of its own specialty: some taking care of nitrogen by pulling the amino acids apart; some of sulphur; some of iron, etc. They constitute the wrecking crew which removes unsightly and abandoned dead organic structures from view and makes the chemical material in the form of the original elements of the earth available for new uses. These organisms are very active chemically and rapidly reduce or mineralize dead organic matter. Saprophytic bacteria are not pathogenic. They do not attack living matter and do not produce disease in the usual sense of the word. Saprophytes, however, may produce poisons which are very dangerous if accidentally introduced into the body, as in the case of botulism poisoning (page 242).

The reason for presenting these phases of the cycle of life at this place is that all three phases, plant, animal, and saprophytic, present microscopic forms which interfere with the chemical functioning of the body when they or their products gain entrance

thereto, and may cause various disturbances or illnesses which we are about to discuss. Since the human animal has evolved in constant association with these minute enemies he has survived because he has acquired protections of many kinds. This chapter, then, presents in brief form a description of these unseen enemies and of the defenses the human organism has acquired against them.[1]

Disease-producing microorganisms are variously called "germs," "microbes," "pathogenic (disease-producing) microorganisms," etc. It is difficult to classify microorganisms, since many are more primitive in form than plants and many others lie between plant and animal forms, having properties of either or both. They include the lowest vegetable forms such as bacteria and also some of the one-celled animals known as protozoa. Among disease-producing microorganisms the bacteria (plant and preplant microbes) constitute by far the larger number.

Pathogenic or infectious microbes, whether plant, animal, or transitional in form, are *parasitic* in character, which means that they must live within and upon living matter, as distinguished from saprophytes, which, as we have seen, live upon dead organic matter.

Infection is the condition in which germs actually invade the body and multiply within the blood or other favorable tissues, producing characteristic disturbances known as disease.

Immunity is a condition of resistance, natural or acquired, such that disease germs are either not able to invade the body or are not able to multiply within it.

Toxemia is the condition in which parasites or saprophytes are in themselves chemically poisonous to the body or produce toxins. Thus, saprophytes such as botulinus (see page 242) and toxic germs such as diphtheria and tetanus injure the body by their poisonous products rather than by their invasion of tissues.

Disinfection means the destruction of disease germs upon a surface or within a tissue, usually by the employment of disinfecting chemical substances called *antiseptics*.

[1] It must be remembered that only relatively few of the known forms of microscopic life ever do the human organism any harm; most are innocuous, and some, such as lactic acid bacilli and colon bacilli, are even necessary and beneficial in carrying on the reduction of food in the bowel and in producing many of the chemical changes in nature.

Sterilization means the total destruction of all microscopic life, usually by the use of extreme heat, dryness, or light.

Contagious, communicable, and infectious disease are terms commonly applied to diseases in which living germs are transferred, directly or indirectly, from the body of an individual having the disease to the body of another individual who may, unless immune, thereby contract the disease.

The Classification of Bacteria.—Many (some 60 or more) classifications of bacterial disease producing organisms have been made: some based on form; others upon chemical character; others upon physiological effects, staining reaction, etc. Zinsser[1] gives a classification adopted by the International Congress of Botanists and the International Society of Microbiologists. According to this grouping bacteria are classified as belonging to *fission fungi* (schizomycetes). Fission fungi are chlorophyll-free plants which multiply by fission in one, two, or three planes, some varieties of which form spores or have flagella. Other varieties of fungi are the familiar yeasts and molds.

As to form, bacteria fall into three general classes or families:

1. *The Coccaceae* (singular, coccus; plural cocci).—The cocci are spherical in form and present characteristic groupings according to their manner of division or multiplication. The diplococci of pneumonia and of gonorrhea tend to remain paired after division; the adjacent surfaces of the paired gonococci become slightly flattened or "biscuit shaped" (Fig. 68, 5). The streptococci of scarlet fever, erysipelas, and blood poisoning (septicemia) divide in one plane and form beadlike chains or strings of spherical germs (Fig. 68, 6). The staphylococci of boils, pimples, and many sinus infections and of certain forms of infection of organs and cavities of the body divide in three planes and form grapelike clusters of germs (Fig. 68, 7).

2. *The Bacteriaceae* (commonly known as bacilli, singular, bacillus) are long or short, cylindrical or rod-shaped straight cells which divide in one plane only and either completely separate or more or less remain in chains. The rod-shaped bacteria may or may not have flagella or form spores. Among the most familiar

[1] ZINSSER, HANS, *Textbook of Bacteriology*, Chap. XI, D. Appleton-Century Company, Inc., 1935.

diseases caused by bacilli are diphtheria, typhoid, paratyphoid, bacillus coli infection, etc.

3. *Spirillaceae* (singular, spirillum; plural spirilla) include all bacterial cells which are spiral or curved in form. The best known pathogenic spirillum is the spirochete of syphilis, which is corkscrewlike in form (Fig. 68, 8).

Filtrable Viruses.—In addition to the forms of disease-producing bacteria described there is another class of microorganisms

FIG. 68.—Forms of bacteria. 1, typhoid bacilli; 2, tetanus bacilli; 3, bacteria with flagella; 4, sporing bacteria; 5, diplococci; 6, streptococci; 7, staphylococci; 8, spirochaeta of syphilis.

which are so small that it has never been possible to see them with the most powerful microscopes, so small that they cannot even be isolated or strained out by the finest laboratory filter. The filtrate (the solution which has passed through a filter), however, will cause the specific disease. It is certain that there are many varieties of filtrable viruses, but it is impossible to classify or describe them under present conditions. Among the common diseases now said to be caused by filtrable viruses are the common cold, infantile paralysis, measles, smallpox, sleeping sickness, influenza, and many others.

Immunity, or resistance to infection (see page 178), is commonly classified as natural and acquired. *Natural immunity* means the resistance with which the body is endowed at birth. Natural immunity varies among races; for example, the Jewish race is highly immune to tuberculosis and the American Indian race highly susceptible. Natural personal immunity may run in families, or it may vary from individual to individual in the same family, and it varies in the same individual at different stages of maturity. Children are susceptible to many diseases to which adults tend to be immune and children will not take some adult diseases. Also an individual may be exposed to a disease and not take it so long as he is in good health, but may take it if he comes in contact with it when overfatigued or run down, or when, as we say, "his immunity becomes low."

Acquired immunity is produced by some specific experience following birth, and may be active or passive. *Active immunity* may be acquired by one attack of some diseases, such as the exanthemata (see page 210), which renders the individual resistant for the rest of his life. Also the introduction of certain bacterial substances (antigens, see page 184) will actively stimulate the body to manufacture immune bodies (antibodies) which may protect the individual temporarily or permanently. Examples are inoculation against typhoid or diphtheria, and vaccination against smallpox.

Passive immunity is a form of temporary immunity acquired through the injection into the body of the ready-made antitoxin (immune body) from the blood of an animal or person who has had the disease and who has thereby actively created immune bodies within the blood serum, instead of causing the body to manufacture its own antibodies. The antitoxins used in the treatment of diphtheria and tetanus are well-known examples (see page 186).

Silent immunity is a form of active immunity acquired through repeated unconscious exposure to antigens in the environment. Thus it is thought that children often acquire a silent immunity to tuberculosis by the time maturity is reached.

The defenses of the body, as has been said, have developed throughout evolutionary history. All living things are forced to go through life beset by enemies that are constantly seeking to

destroy them. All living things are equipped with means of defense, which may be *physical*, such as horns, claws, shells and teeth, or may be *chemical*. H. Gideon Wells says,

Chemical warfare is neither a human nor a recent achievement. Our chemical warfare service [gas bombs] was long antedated by its prototype, the skunk. The smoke screen of the navy and the aeroplane is but a recent imitation of the ink clouds of the squid. Even the primitive chemical warfare with the poisoned arrow of the aborigines was long antedated by the venomous snakes, whose beautifully functioning apparatus for hypodermic injections is a marvel of efficiency and clever construction.

But our most dangerous and persistent enemies are not those that can be seen with the naked eye. . . . The number of these invisible enemies is legion, and against them invisible agents must be used for warfare. We are eagerly seeking and hoping to find new artificial means for chemical warfare against these invisible parasitic enemies.[1]

Man's resistance to infection brings into play three lines of defense:

1. The first is *the structural and chemical barriers* which prevent the entrance of microbes. *The skin* is practically impervious to bacterial invasion. The flattened, parchmentlike outer layer is sealed and waterproofed by the cholesterol secretion of the oil glands of the skin. *The mucous membranes* of the eye, nose, throat, ear, and vaginal surfaces are covered with mucous secretions which have some bactericidal properties but which act chiefly by catching germs and foreign substances and preventing their further progress into the body or their contact with the vascular basal membrane underneath which would admit them into the tissues. Dr. Frederick Gay says that millions of bacteria perish within a few minutes after being sprayed into a healthy nose and thus never reach the throat.[2] Most mucous membranes are covered with velvety cilia which are always in wavelike motion carrying foreign substances toward the exterior of the body. Even the lining of the digestive tract will not, in a condition of

[1] WELLS, H. GIDEON, *Chemistry in Medicine*, Chap. IX, "Immunity," pp. 559–560, Chemical Foundation, 1928.

[2] GAY, FREDERICK, "Tissue Resistance and Immunity," *Journal of the American Medical Association*, Oct. 24, 1931.

health, admit pathogenic germs into the body tissues. *Chemical barriers* are provided in the various fluids of the digestive tract such as the saliva, gastric fluid, pancreatic juice, and bile, all of which are more or less antiseptic in character. Even tears and sweat, by virtue of their saltiness, are mildly antiseptic and tend to wash away injurious substances.

2. If germs do gain entrance through some break in the protective surfaces of the body, *the next line of defense consists of the internal fluids*, the blood and lymph, which prevent or retard the multiplication or development of bacteria. The *phagocytic* or ameboid cells found in both blood and lymph have as their function the destruction of foreign substances, including pathogenic germs (page 109).

Also, the body reacts in a defensive manner to infections which localize, and such foci of germ activity become surrounded with *inflammatory exudate,* thus walling off or circumscribing the activity of the germs, preventing the spread of the infection, and causing the ultimate destruction of the germs. It is safer to wait until a boil or abscess is fully "walled off" or "comes to a head" before opening it, as there is then less danger of releasing germs into the blood stream.

3. If, in spite of these ready-to-use defenses, microbes do gain foothold and begin to multiply, the disease-producing organisms act as antigens (see page 184) and (it is now generally believed) stimulate the reticulo-endothelial tissues of the body (see page 184) to manufacture and release into the blood stream specific antagonistic substances called *antibodies.*

Antibodies.—Immune blood contains chemical factors called antibodies which combine with and destroy disease germs or neutralize their products, and may also neutralize specific chemical substances, other than disease germs, which are harmful to the body. Antibodies represent complex chemical devices for the protection of the body which belong to the category of mysterious and elusive substances of incredible concentration and potency such as hormones, (Chap. XIV), vitamins (Chap. X), and enzymes (see page 80). Antibodies have not been seen, analyzed, or isolated, and their exact mode of operation is still in doubt. Like most of these other substances they have been studied by their effects and used experimentally and therapeuti-

cally (curatively) in body fluids containing them.[1] It is impossible to be very definite or specific as to the exact character and action of chemical entities which have not been seen, and the chemical composition of antibodies is unknown. Many theories and speculations have been advanced.

Reticulo-endothelial Cells.—While the exact source and character of antibodies are still unknown there seems to be agreement at the present time that they probably are manufactured by certain not well-understood cells, called *reticulo-endothelial cells,* which are found widely distributed in the body: in the spleen, bone marrow, lymph glands, and certain areas in the liver, in the thymus, and in connective tissue spaces. The reticulo-endothelial cells are embryonic in character and may participate in a number of other vital processes of the body, such as the formation of blood and bile[2] (see page 108).

Antigens are chemical substances foreign to the body, such as specific chemical factors in disease germs or snake venom, or entire microorganisms, or tissue or plant cells, or protein compounds in foods—any substance, in fact, which causes formation of antibodies in the blood or tissues. So far as known all antigens are colloids (see page 21) and, with few if any exceptions, they are proteins or specific protein compounds (haptens). Proteins are made up of amino acids, which are normally released in digestion and circulate in the blood as free amino acids (see page 72).

[1] "Immunological reactions, the processes by which the living organism defends itself against the chemical attack of its enemies and so is able to exist in an environment seething with such enemies, are chemical reactions. The reagents involved are substances endowed with active chemical properties, and they are the product of chemical activity of the tissues of the body. In few if any cases do we know the chemical composition of either the poison of the parasite or of the defensive agent of the host, and our knowledge is gained entirely by observing the reaction or the effects resulting from the reaction." WELLS, H. GIDEON, *The Chemical Aspects of Immunity,* p. 21, Chemical Catalog Company, Inc., 1929.

[2] SHERWOOD, NOBEL P., *Immunology,* p. 77, C. V. Mosby Company, 1935.

MARTIN, HENRY NEWELL, *The Human Body,* p. 330, Henry Holt & Company, 1934.

KOLLE and HETSCH, *Experimental Bacteriology,* p. 95, The Macmillan Company, 1935.

WELLS, H. GIDEON, *Chemical Aspects of Immunity,* p. 126, Chemical Catalog Company, Inc., 1929.

Free amino acids never act as antigens; hence antigens appear to be proteins which for various reasons may not be split into free amino acids before entering the blood stream. Even more specifically, it seems that only proteins containing certain aromatic amino acids act as antigens.[1]

Antigens (germs or other foreign proteins) on entering the body combine with the defensive antibodies of specific diseases, which may be already present or which may then be formed, and effect changes which result in destruction of the bacteria or neutralization of the antigen, and usually render the individual more or less permanently immune to the disease. In other diseases, while sufficient defensive reaction occurs to effect recovery, there is no lasting union between antigen and antibody and the individual may have one or many subsequent recurrences of the infection and may even be more susceptible than before.

The manner of reaction between antigen and antibody depends at least in part upon the character of the antigen. (Some think there is only one general antibody and that differences in reaction depend entirely upon the antigens.) When the antigen is of the nature of *soluble proteins,* such as bacterial filtrates, venoms, or serum, the antibody combines with the proteins in the antigen to form a fine *precipitate* which falls to the bottom of the test tube. This kind of antibody is called *precipitin.* When the antigen consists of whole bacteria or larger particles than those in solution, the antibody causes the particles or the bacteria to clump, or cluster, or *agglutinate,* and the antibody is called *agglutinin.* The Widal test for typhoid consists in combining typhoid culture with blood from the suspected person. If agglutinin is present the bacilli will "clump" (Fig. 69).

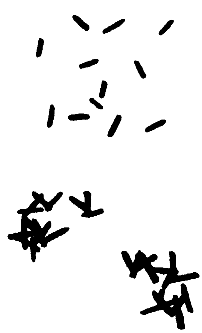


FIG. 69.—Agglutination of bacteria.

Human blood of type I, does not have agglutinins, and an individual having this type is said to be "a universal donor." Individuals having blood of type II, III, or IV must receive, in transfusion, blood of the same type as their own or agglutinization

[1] SHERWOOD, *op. cit.,* p. 329.

or clumping of the transfused blood will occur with serious consequences to the patient.

In diphtheria, tetanus, and a few other less well-known diseases, the *toxins* secreted by the bacteria act as antigens, and the resulting antibody is called an *antitoxin*. When antitoxin is injected into the blood of a patient suffering from the specific disease it acts as a true chemical antidote and arrests the action of the toxin and recovery usually follows (see page 210 for diphtheria, and page 433 for tetanus).

Certain cellular or tissue antigens, including foreign red blood cells, some bacteria, and certain other cellular units, act as protein or protoplasmic complexes or units rather than as separate proteins. The antibodies formed in such instances may literally dissolve the cells by *lysis* and are called *lysins.*

Some bacteria act as lytic antigens and cause the formation of antibodies called *bacteriolysins.* Lysins will not produce their characteristic reactions, however, except in blood serum. It appears that there is in normal blood serum a *complementary substance* which must unite with both antigen and lysin before lysis will occur. This accessory factor is called *complement* or *alexin.* The combination of antigen-antibody only is necessary to the production of immunity in the case of precipitins, agglutinins, or antitoxins. The combination of antigen-antibody-complement is necessary to the production of immunity when the antigen is large and complex and the antibody is lytic in character. The chemical character of complement is unknown except that it seems to have the digesting property of an enzyme and that it probably exists in all normal blood.

In the case of *phagocytosis,* mentioned under defenses of the body, page 183, the ameboid white blood cells dissolve or digest certain types of antigenic bacteria, notably the cocci, or pus-forming bacteria. Like lysins, phagocytes also act only in the presence of normal blood serum, which contains a specific complementlike substance called *opsonin.* It is sometimes facetiously said that the opsonins "butter the bacteria" and so make them palatable to the phagocytes as food.

Bacteriolysis and phagocytosis are doubtless the same process operating with different types of antigens.[1]

[1] "Fundamentally, serum bacteriolysis and bacterial destruction by phagocytosis seem to be the same—in each case a specific antibody sensiti-

Immunization by Antigens.—It was a great event in medical science when Pasteur discovered that immunity to disease could be established by injecting a few live germs into the body.[1] It had been known for a long time that smallpox could be prevented by rubbing fresh secretions from a pox or eruption into a slight scratch of the skin, although it was not known why the result was achieved.[2] It has taken long, patient research, however, to find out just how to use specific germs as antigens in order safely and successfully to provoke the body to manufacture antibodies. In smallpox, a minute amount of living virus is introduced through broken skin. In typhoid, dead germs are used as antigen; in diphtheria and tetanus, the toxin, in combination with a protective substance such as antitoxin or formalin (see page 174), will cause antibodies to appear. In others a mild or "attenuated" culture is used, in which the germs have lost much of their virulence but not this antigenic property.

In many diseases it has not yet been possible to discover a way of producing artificial immunity. In others the immunity so conferred is temporary and not yet entirely certain. Many difficult biochemical problems await solution. It is doubtless, however, only a matter of time when it will become possible to establish chemical defenses within the body for all microbic diseases.

Since microorganisms, including many disease-producing organisms, are virtually omnipresent (great heights above the earth and great depths below the surface are relatively free) the wisest policy for one to pursue who wishes to escape communicable disease is not only to avoid contact as far as possible, but especially to keep his body defenses (page 181) intact, and build up artificial chemical immunity to the highest possible level.

Carriers.—Disease germs may be conveyed indirectly from a diseased individual to another by insects, such as flies and cockroaches, which may convey microbes from place to place on their

zation prepares the bacterium for lysis by enzymes [opsonin and complement] either inside or outside the cells that furnish the lytic enzyme." WELLS, H. GIDEON, *op. cit.*, p. 268.

[1] "Louis Pasteur," *Health Hero Series*, School Health Bureau, Metropolitan Life Insurance Company.

ZINSSER, *op. cit.*, Chap. I, "The History and Scope of Bacteriology."

[2] "Edward Jenner," *Health Hero Series*, School Health Bureau, Metropolitan Life Insurance Company.

feet. Lice, fleas, and bedbugs also may act as mechanical carriers, or they may become infected through biting a diseased animal or human and then in biting other persons transmit the living germs. Bubonic plague and trench fever may be conveyed by the bite of the rat flea and body louse, respectively.

The protozoon of malaria and the germ of yellow fever live one cycle of their lives in the bodies, respectively, of the malarial mosquito (anopheles) and the yellow-fever mosquito (stegomyia). The mosquito bites an infected human being and, after the maturing of the germs in its own body, infects all other persons bitten.

Extermination of rats, vermin, and disease-conveying insects, especially mosquitoes, is an important item in every public health program.

Healthy Human Carriers.—In addition to mechanical carriers and hosts, as mentioned, there are persons who harbor live disease germs within their bodies and may communicate disease to others but who show no symptoms of having the disease and often no history of having had it. Diphtheria and typhoid are the two best known instances of diseases so conveyed. It is difficult, sometimes impossible, to sterilize carriers, and epidemics may be started by such persons. Carriers should always be identified and undergo treatment, and should never in any capacity handle food intended for others, or render personal services such as those of barbers, cosmeticians, or nurses.

Nursing Infectious Diseases.—The patient should occupy a room by himself or at least with only his mother or nurse. It should be an airy, pleasant room, kept at a uniform temperature of 65° to 70° unless otherwise ordered by the physician. The air should be kept cool, moist, and moving, and the patient protected from draft by screens.

The home nurse should, if possible, devote herself to the case. If the patient is not very ill and the mother must also do the other work of the home she must develop a "sixth sense" which tells her where germs could possibly lodge. She should put on a smock or apron on entering the room and remove it on leaving. She should keep a basin of disinfectant at the door and dip her hands in it on leaving the room. She must not touch her own hair, face, or clothing while in the room. A paper bag with the

rim turned back should be pinned to the side of the bed to receive all infected dressings, paper kerchiefs, etc.; this is burned. Dishes and utensils should be scalded or immersed in disinfectant before they are brought to the kitchen sink. The top sheet should fold well over the edge of the spread and blanket and this sheet and the pillowcases should, in all respiratory infections, be scalded, immersed in disinfectant, or exposed to direct sunlight before being sent to the laundry. The draw sheet should be disinfected where intestinal infection exists, as in typhoid or dysentery.

The disinfection of bowel and bladder discharges is important in typhoid, dysentery, and all infections of the bowel and bladder. Chloride of lime, unslacked lime, lysol, or other cheap and powerful disinfectant must be thoroughly mixed with the excreta, and permitted to stand for 10 to 15 minutes until thorough penetration is certain before feces or urine are emptied into any toilet, indoors or out.

Terminal Disinfection after Contagious Diseases.—When a patient is released from quarantine the following procedures should be followed. The patient should be given a shampoo, a manicure with nails trimmed short and scrubbed, a warm soap bath, then clean clothes which have not been in the sick room.

The room should then be freely opened to outdoor air and especially to sun. If the sun is shining the mattress, pillows, blankets, etc., should be carried out and thoroughly sunned on several successive days. Everything which can be laundered should be so treated. The woodwork, floor, and furniture should be washed with soap and water or wiped with a disinfectant oil if soap cannot be used without injuring the surfaces.

Personal belongings, playthings, and books may be placed loosely in a tight box or closet and fumigated by burning a formaldehyde candle. There must be moisture such as that from a wet towel, or through sprinkling or spraying, and everything should be open to the penetration of the gas. It was formerly customary to seal the room and fumigate, but the procedures here indicated are now considered adequate, as most germs perish quickly on exposure to light and air, and by the end of the required isolation or quarantine period there are comparatively few active germs remaining.

References

"Edward Jenner," *Health Hero Series*, School Health Bureau, Metropolitan Life Insurance Company.

GAY, FREDERICK: "Tissue Resistance and Immunity," *Journal of the American Medical Association*, Oct. 24, 1931.

KOLLE and HETSCH: *Experimental Bacteriology*, The Macmillan Company, 1935.

"Louis Pasteur," *Health Hero Series*, School Health Bureau, Metropolitan Life Insurance Company.

MARTIN, HENRY NEWELL: *The Human Body*, Henry Holt & Company, 1934.

SHERWOOD, NOBEL P.: *Immunology*, C. V. Mosby Company, 1935.

WELLS, H. GIDEON: *The Chemical Aspects of Immunity*, Chemical Catalog Company, Inc., 1929.

———: *Chemistry in Medicine*, Chemical Foundation, 1928.

ZINSSER, HANS: *Textbook of Bacteriology*, D. Appleton-Century Company, Inc., 1935.

New Terms in Chap. XIX

Allergy. A condition in the human being of hypersusceptibility to foreign proteins.

Anaphylaxis. A condition in the animal of hypersusceptibility to foreign proteins.

Atopy. An allergic state having a hereditary basis

Dermatitis. Inflammation, redness, or eruption on the skin.

Desensitization. Correction of the hypersensitive state by the use of small doses of the offending antigen.

Eczema. The name given to a class of skin eruptions, some of which are known to have an allergic basis. Eczema is characterized by a thick, moist, scaly, itching eruption.

Hives. A type of allergy in which red, itching wheals or lumps rise on the surface of the skin, sometimes very swiftly, on exposure to the offending antigen.

Hypersensitization. A general term including allergy and anaphylaxis.

Shock organ. The tissue which responds to the sensitizing antigen in allergy or anaphylaxis.

Urticaria. A synonym for hives.

CHAPTER XIX

HYPERSENSITIZATION

(Anaphylaxis and Allergy)

Hypersensitization is the term applied to a group of variable reactions believed to depend upon the antigen-antibody mechanism described in the previous chapter as responsible for immunity. The hypersensitive reactions are peculiar or nontypical, however, and may be called immunological diseases.

Antibodies have not been seen or chemically analyzed, and even regular immunity is not fully understood. A great variety of symptoms and disorders have come to be included within the general group of hypersensitive reactions. Immunologists, therefore, do not fully agree as to all the factors probably involved, and naturally they do not fully agree upon classification. For convenience of presentation the classification used by most American immunologists will here be used. The student is urged to follow the report of present and future investigation, as points of present doubt and obscurity are rapidly becoming clear, and methods of treatment of practical importance to the general public are now in process of development.

The first question yet to be solved is whether hypersensitization is due *always* to some peculiar experience of the animal or person, which has rendered certain of his tissues "sensitive" to specific antigens (as in anaphylaxis and nonatopic allergies), or whether in at least one class of disorders (atopys) the individual manifesting these is born with certain of his tissues already "sensitized" or susceptible to antigens and structurally ready to behave differently from the tissue of normal individuals. In a word, is hypersensitization potentially inherent in all victims of such disorders, is it inherent in some and not in others, or is it acquired by all?

In connection with immunity we saw that disease germs most commonly act as antigens and cause the formation of protective antibodies such as precipitins, agglutinins, lysins, etc., although

other organic substances, such as snake venom, may act as antigens (see page 184). In hypersensitiveness, disease germs do occasionally produce the symptoms peculiar to allergy apart from the symptoms of the disease or the changes of immunity. Most often, however, the antigens producing hypersensitization are very ordinary substances which do not produce any unfavorable reaction in normal individuals. Almost any article of food, many animal danders, pollens of certain plants, and house dust may produce specific symptoms in hypersensitive individuals.

Apparently the nontypical thing that occurs in hypersensitization is that the antibodies already present or formed under the stimulus of the antigen are "fixed" to certain susceptible tissue cells called "shock organs." When the antigen reaches these cells, either through the blood stream as in the case of food antigens or by contact as through inhalation of pollen or dust antigens, there is a disturbance of the normal physiology of the tissue. The location of the sensitized cells determines the type of allergic disease experienced by the individual. If the shock organ is the mucous membrane of the nose, hay fever results; if the lungs, asthma; if the gastrointestinal tract, colic and indigestion; if the skin is sensitized a variety of rashes and eruptions may appear, such as eczema, hives (urticaria), "stomach rash," etc. Food antigens may, by way of the blood stream, reach and affect sensitized organs in any part of the body, and may be responsible for certain obscure headaches, joint pains, etc., and simulate many other diseases.[1]

The classification most commonly used at present divides animal sensitizations from those of human beings, and separates the human disorders having rather obvious hereditary basis from those in which heredity cannot be demonstrated as a causative factor.

Anaphylaxis (ana, without; phylaxis, protection) includes all animal hypersensitization. There is no specific hereditary factor

[1] Smul, J. S., "Clinical Evidence of Fifty So-called Gastrointestinal Diseases Which Really Are Caused by Food Allergy," *Journal of the American Dietetic Association*, July, 1935.

Forman, J., "Atopy as Cause of Epilepsy." *Journal of the American Medical Association*, Nov. 10, 1934.

Sheldon and Rahdol, "Allergy in Migraine-like Headaches," *American Journal of the Medical Sciences*, August, 1935.

in animal reactions, as all animals react in some way and all animals of one species react alike to similar conditions. Anaphylaxis does not occur naturally or spontaneously, as animals must be prepared or sensitized by previous intentional or accidental inoculation with the antigen, usually a protein which has not broken down into free amino acids (a "foreign protein"). After a latent period of several days, varying with the antigen and the animal, another inoculation with the antigen, which may be egg white, horse serum, wheat protein, or any one of numberless substances, will produce more or less violent reactions. If the animal is a rabbit the circulatory system is always the shock organ; in guinea pigs it is the lungs; in dogs it is the liver. Rats are not easily sensitized. A sensitized animal may exhibit a mild or a violent reaction on injection of unbelievably minute amounts of antigen and in extreme cases may die of asphyxiation, heart failure, or acute toxemia within a few minutes.

If an animal survives anaphylactic shock it is usually desensitized and is immune to the specific antigen ever after . Anaphylaxis may be called "hair-trigger immunization." Anaphylaxis was first accidentally produced in laboratory animals which were used in immunological experimentation. The term was also applied to serum sickness and serum shock in human beings until recently, when a group of immunologists, notably Coca,[1] decided that so many points of difference existed in both the animal and human physiologies and in the methods of using antigens with the two groups that, for the present, animal hypersensitization should be classed by itself. In general literature, however, the student will find the term anaphylaxis often applied to human allergy.

Allergy is the term now must commonly applied to all human hypersensitization and is further divided into hereditary and nonhereditary types.

Atopy ("strange disease") includes hay fever, asthma, certain gastrointestinal allergies, and certain skin allergies. Those who believe in nonacquired hereditary susceptibility think that the atopic individual is born with certain tissues and organs which will become shock organs whenever they are exposed, under given conditions, to the antigens to which they are susceptible.

[1] Coca, Arthur F., and others, *Asthma and Hay Fever in Theory and in Practice*, Chas. C. Thomas, 1931.

These susceptibilities, although inherited in potentiality, change with growth and maturation of the tissues. The intestinal tract and skin of infants are especially apt to be shock organs, and the infant is likely to have colic, eczema, and rashes. Later in life colic and eczema may disappear; his lungs or his respiratory membranes may show allergic behavior and asthma or hay fever may take the place of the early allergies.

Moreover an individual may be so unfortunate as to have several shock organs and may be sensitive to a variety of antigens. Dr. Withers[1] describes a young man who had a history of childhood eczema due to eggs. At the time specified he presented gastrointestinal sensitivity to three foods (but not to egg); contact with a dog produced hives; while three varieties of ragweed produced asthma and hay fever successively—a total of four shock organs and seven clinically active antigens.

There is some evidence that atopic susceptibility is inherited as a Mendelian recessive trait and, as has been said, previous sensitization is not essential to atopic symptoms. Allergic tendencies, however, rather than specific allergies, run in families. For example, a parent having hay fever may have one child subject to asthma and another one subject to hives. While it is difficult to establish proof of heredity in all instances, owing in part to the general lack of family trait history, sufficient evidence has been produced to lead most authorities to believe that hereditary structural peculiarity is probably always a factor.

Diagnosis of Atopy.—Irrespective of the shock organ or organs involved, the skin is usually sensitive and often reacts to the offending antigens. The skin tests for allergies are well known and test solutions are legion. Skin sensitivity varies, however, from one part of the body to another, and from one time to another. Positive skin reaction does not always mean that the patient is *actively* (clinically) sensitive. Positive skin reactions aid in diagnosis but are not alone conclusive. Elimination diets by botanical food classification,[2] and other diagnostic measures are used in conjunction with the skin tests.

[1] WITHERS, ORVILLE R., *Fundamentals of Allergy*, Bulletin of the Southwest Clinical Society, Kansas City, Mo., December, 1933.

[2] Individuals are apt to be sensitive to genetically related groups or classes of foods—*i.e.*, a person allergic to beans may also react to peas, peanuts, and lentils.

Treatment of Atopy.—It is possible in some cases to build a tolerance to the offending substance with repeated injections of the particular antigen in much the manner of bacterial immunization by repeated doses of bacterial antigens. Avoiding the specific antigen is a certain way of preventing the disturbance.

In the case of food allergies, after the victim has become symptom-free for a period through eliminating the offending substance, he can sometimes after the lapse of a certain interval return very gradually to the use of the food in question without return of allergic symptoms. Nursing infants are sometimes allergic to proteins in the mother's diet, and may show colic or rashes. The mother must use food-elimination diagnosis and avoid the food which is causing the trouble. The child may or may not be allergic, in his own subsequent diet, to the wheat, beef, or whatever in his mother's milk caused his trouble. Children are sometimes allergic to cow's milk but not to goat's milk.

Immediate relief of the acute respiratory distress of asthma and hay fever may usually be obtained by epinephrin (adrenalin; see page 137) used hypodermically or ephedrine (see page 370) applied locally. The frequent or continued use of these drugs, however, is undesirable, and the constant use of a spray may cause chronic congestion of the mucous membranes. One should not depend upon temporary relief, since it is more important to discover the cause of the attacks and prevent them.

The Nonatopic allergies include a variety of human allergies in which it has not been possible to establish an hereditary basis, and in which initial or acquired sensitization is necessary as in the case of animal anaphylaxis.

1. Bacterial Allergy.—In tuberculosis (and less often in other infections) the individual may become actually sensitized by the bacteria and exhibit reaction to the subsequent injection of tuberculin. The condition, although one of the first allergies to be observed, is still perhaps the least understood of all.

2. Contact dermatitis includes those cases in which the individual has acquired skin sensitization which reacts to contact with various substances such as poison ivy, poison oak, turpentine, cosmetics (notably those containing orris root), and various other chemicals, all substances which are nonirritant to normal or nonallergic individuals. Some progress has been made in

developing desensitizing serums, but avoidance is yet the best policy. (For treatment of ivy poisoning see page 467.)

3. DRUG ALLERGY is a susceptibility found in persons who have become sensitized to certain chemicals or drugs, and who experience a rash or exhibit other allergic symptoms on taking quinine, aspirin, or some other usually harmless medicine. There is no treatment except avoidance, and this is usually possible.

4. SERUM SICKNESS is a form of allergy shown by many persons after receiving injections of immunizing serums, notably those in which the immunizing antigen is contained in horse serum. It is assumed that there has been some previous sensitization to the horse serum, although atopic persons having hereditary susceptibilities are more likely than others to experience serum sickness and serum shock.

Allergic symptoms appear as a rule several days after the inoculation. As has been said there is a latent period (sometimes called the incubation period) during which antibodies are supposed to be combining with the tissue cells and with the antigen contained in the inoculating substances. The symptoms are usually limited to mild rash, joint pains, headache, and fever.

5. SERUM SHOCK ("serum accident") is an extreme form of allergic reaction which occurs most often in atopic individuals. It is comparable in some features to anaphylactic shock in animals; it was formerly called anaphylaxis and still is so classed by some immunologists, notably Zinsser, who thinks that there are "fundamental similarities" in all hypersensitizations.[1]

Serum shock usually occurs immediately with the first serum inoculation, in which case it is assumed that the subject has been sensitized by some previous exposure, known or unknown, to the particular serum antigen, or it may occur when the second inoculation is given. In serum shock the blood pressure falls, bronchioles and arterioles are constricted, a rash appears suddenly, the victim struggles for breath, and in rare and extreme instances he may die.

Because of the association of serum shock with atopic constitution (some think it occurs only in atopic persons) any individual receiving serum inoculations of any sort should inform the doctor

[1] ZINSSER, HANS, *Textbook of Bacteriology*, pp. 249, 268, D. Appleton-Century Company, Inc., 1935.

if he has had previous inoculations and, especially, if he has ever had asthma, hay fever, hives, or other atopic disorder.

Antigens are now produced from sheep, cows, and animals other than the horse for use with persons who are allergic to horse serum.

6. PHYSICAL ALLERGY.—The extreme allergiclike reaction some persons show to heat, as heat rash; to cold, as hives; and to light, as excessive sunburn, is sometimes called "physical allergy." There is little basis for classifying this as true allergy, and little is known as to cause or management.[1]

References on Infection, Immunity, and Hypersensitization

ARNOLD, OSTROM, and SINGER: *Proceedings of the Society of Experimental Biology and Medicine*, 1928.

BROADHURST, JEAN: *Bacteria in Relation to Man*, J. B. Lippincott Company, 1926.

COCA, ARTHUR F., and others: *Asthma and Hay Fever in Theory and Practice*, Chas. C. Thomas, 1931.

Editorial, "Physical Allergy," *Journal of the American Medical Association*, Sept. 29, 1934.

FLEMMING and PETRIE: *Recent Advances in Vaccine and Serum Therapy*, P. Blakiston's Son & Company, 1934.

FORMAN, J.: "Atopy as Cause of Epilepsy," *Journal of the American Medical Association*, Nov. 10, 1934.

GAY, FREDERICK: "Tissue Resistance and Immunity," *Journal of the American Medical Association*, Oct. 24, 1931.

Health Hero Series: Jenner, Pasteur, Koch, Reed, Trudeau. School Health Bureau. Metropolitan Life Insurance Co.

MARTIN, HENRY NEWELL: *The Human Body*, 5th ed., Henry Holt & Company, 1934.

SHELDON and RAHDOL: "Allergy in Migraine-like Headaches," *American Journal of the Medical Sciences*, August, 1935.

SHERWOOD, NOBEL P.: *Immunology*, C. V. Mosby Company, 1935.

SMUL, J. S.: "Clinical Evidence of Fifty So-called Gastrointestinal Diseases Which Really Are Caused by Food Allergy," *Journal of the American Dietetic Association*, July, 1935.

VAUGHAN, W. T.: "Mechanism of Allergic Response," *Journal of the American Medical Association*, May 16, 1936.

WALDBOTT, GEORGE: "Allergic Death," *Archives of Internal Medicine*, October, 1935.

———: "So-called Thymic Death," *American Journal of the Diseases of Childhood*, January, 1934.

[1] Editorial, "Physical Allergy," *Journal of the American Medical Association*, Sept. 29, 1934.

———: "Asthmatic Infants," *American Journal of the Diseases of Childhood*, June, 1935.

WELLS, H. GIDEON: *Chemistry in Medicine*, The Chemical Foundation, 1928.

———: *Chemical Aspects of Immunity*, Chemical Catalog Company, Inc., 1929.

WELLS, HUXLEY, and WELLS: *Science in Life*, Doubleday, Doran & Company, Inc., 1931.

WITHERS, ORVILLE R.: *Fundamentals of Allergy*, Bulletin of the Southwest Clinical Society, Kansas City, Mo., December, 1933.

ZINSSER, HANS: *Textbook of Bacteriology*, D. Appleton-Century Company, Inc., 1935.

New Terms in Chaps. XX to XXV

Antiseptic. A substance which inhibits the growth of microorganisms.

Autogenous vaccine. A vaccine made from cultures of germs taken from the individual's own body.

Botulism. Food poisoning caused by the toxins produced by germs found in slightly spoiled food.

Catharsis. Emptying the bowel by the use of a cathartic.

Chancre. The swelling or pustule appearing at the place of entrance of the germs of syphilis.

Desquamation. Peeling or scaling, removal of any surface; applied to the peeling off of eruptions.

Dick test. The skin test for susceptibility to scarlet fever.

Gastrointestinal. Pertaining to the entire digestive tract, the stomach and bowels.

Gumma. Granular formations in tissue infected with syphilis.

Incubation. The period following the initial introduction of infectious germs into the body, during which the germs are multiplying to the point at which they affect the body chemistry and produce symptoms.

Larva (plural, larvae). A period in the development of some insects during which they are quite unlike the parent species.

Mantoux test. A skin test for sensitivity to tuberculosis.

Orthopedist. A specialist in the treatment of deformities.

Parotid gland. The salivary gland which lies nearest the ear.

Peyer's patches. Lymph glands in small intestine.

Prodrome. The period of indefinite illness following the incubation period of an infectious disease.

Pustules. An elevation of tissue filled with pus.

Saturated solution. A solution in which the solvent or fluid will not absorb more of the substance being added—any added from this point falls to the bottom as a precipitate.

Schick test. The skin test for susceptibility to diphtheria.

Toxin-antitoxin. An immunizing serum in which toxin is combined with antitoxin; used specifically in immunization against diphtheria.

Toxoid. A toxin which has been rendered nonpoisonous by the addition of a chemical such as formalin or alum.

Tubercle. Granular formation in tissue caused by the presence of tubercular germs.

Venereal. A term applied to the diseases which may be acquired through sexual intercourse, chiefly gonorrhea and syphilis.

CHAPTER XX

THE EXANTHEMATA

The exanthematous diseases ("breaking-out diseases") are smallpox, chicken pox, measles, German measles, and scarlet fever. With the exception of smallpox these diseases are particularly likely to occur in early childhood, and are often referred to as "children's diseases." In common with all infectious diseases the exanthemata follow certain stages of development.

1. *Incubation* is the period between exposure to the germs and the appearance of the first symptoms of illness. The length of time required for the multiplication of the few germs first gaining entrance to a number sufficient to produce reaction (symptoms) in the body varies from a few days in the case of scarlet fever to two weeks or more in German measles.

2. *Prodrome, or invasion,* is the name given to the first indefinite symptoms of illness such as headache, backache, chilliness, inflammation of nose and throat, etc., symptoms which appear with many diseases. During the prodromal period it may be impossible to diagnose the disease, *but it must be remembered that the contagious diseases are more communicable during the unrecognized prodromal stage than they are later.*

3. *The third stage* is marked by the appearance of the characteristic symptoms which make diagnosis positive. In the exanthemata this is the stage of *eruption.*

4. *Convalescence.*—In the eruptive diseases the fourth stage is marked by the scaling or peeling of the eruption (desquamation). This is probably the least contagious period of the disease, although formerly considered to be the most highly communicable stage.

Smallpox (variola).—The germ causing smallpox has been one of the most difficult to isolate and study, although smallpox is one of the oldest known of the contagious diseases and the first in which artificial immunity was established by vaccination. The

specific cause is generally believed to be a filtrable virus.[1] It may occur at any time from birth to old age. Before the spread of vaccination, smallpox was known in Germany as *Kinderblattern* or "a children's disease." It is now much more prevalent in adults. No race is immune, although the races which have experienced it the longest show the mildest forms; for example, the Negro is more susceptible than the white American.

In its ancient virulent form it was a loathsome, disfiguring disease, perhaps the most dreaded of human plagues before the days of control and modern treatment.[2] It was estimated that 60 million people died of smallpox in Europe in the eighteenth century, and few escaped having the disease sometime during life. In 1930 in the New England and Middle Atlantic states, with a population of 37 million, only 479 cases of smallpox occurred, with two deaths. During the same period among states having less effective regulation, with some 54 per cent of the total population of the United States, 43,000 cases occurred or 97 per cent of the total cases reported in the United States.[3]

Symptoms.—The period of incubation is 9 to 15 days. The prodrome of 3 to 4 days is characterized by high fever, chills, severe headache, and backache, and may be mistaken for influenza. The eruption then appears as shotlike nodules which ulcerate and discharge.

Smallpox is highly contagious, and the germs may be conveyed through the medium of all the discharges and secretions of the body. Strict isolation of both patient and nurse is important, with thorough sterilization of all objects and supplies leaving the sick room.

Complications.—Pneumonia, ear and eye trouble, changes in bone, kidneys, liver, spleen, etc., may accompany or follow smallpox. Pregnant women are highly susceptible, and the toxins are likely to cause the death of the fetus.

Nursing.—Good general nursing care with intelligent management of diet, elimination, and sleep is indicated. The special problem is the care of the pustules, which burn and itch intensely.

[1] SHERWOOD, NOBEL P., *Immunology*, C. V. Mosby Company, 1935.

[2] "Smallpox, Historical and Geographical Prevalence," *Health Bulletin for Teachers*, Metropolitan Life Insurance Company, September, 1935.

[3] *Statistical Bulletin*, Metropolitan Life Insurance Company, May, 1931.

The eruptions even appear in the nose and ears and about the eyes. All eruptive surfaces should be kept moist with applications of oil or mild liquid antiseptic, which will be prescribed by the physician. Saturated solution of magnesium sulphate is sometimes used, or a weak solution of alcohol and water. The eyes should be covered with compresses wet in boric acid or normal salt solution. The discharges in the nose and ears should be constantly removed with pledgets of cotton held in forceps and dipped in oil or warm antiseptic. The utmost gentleness must be observed in order not to cause pain. The nurse must not permit any discharging pustules to become dry or caked with secretions. During desquamation (peeling or scaling) the doctor usually instructs the nurse to spread carbolized vaseline or other oily substance over the skin both to allay the itching and to prevent the eruptive particles from escaping into the air.

The hands of children may have to be padded thickly with cotton and bandaged in order to prevent scratching, which will cause scars. Books on the subject commonly say the hands of a child should be restrained. This adds so acutely to the discomfort of the little sufferer that it should be avoided if possible. Keeping the surfaces moist or anointed to lessen the intolerable itching is especially important with children.

Prevention consists, first of all, in early vaccination. Rosenau[1] says all infants should be vaccinated at about six months, thus avoiding the period of teething and weaning. He states that there is no contraindication to vaccinating infants soon after birth, but that the "takes" are more certain at the later period.

The duration of immunity varies in different persons. It is commonly advised that all individuals be revaccinated every 7 to 10 years. Modern methods of vaccination are painless and less apt to produce excessively unpleasant reaction than was the former procedure. It is a very trivial matter to be vaccinated. If immunity exists there will be no reaction, and the tiny scab will disappear without scar. If one is not immune he certainly should know it.

Terminal disinfection should be thorough, as described on page 189.

[1] Rosenau, Milton J., *Preventive Medicine and Hygiene*, p. 12, D. Appleton-Century Company, Inc., 1931.

Chicken Pox (varicella).—The cause of chicken pox is as yet unknown but is generally believed to be a filtrable virus. Chicken pox is a relatively mild disease characterized by small pustular eruptions closely resembling those of light smallpox. Indeed many smallpox epidemics have resulted from cases of smallpox being mistaken for chicken pox. Epidemiologists (specialists in communicable disease) commonly advise strict quarantine of all cases of supposed chicken pox in adults, as real chicken pox is rather strictly a disease of childhood.

The Symptoms.—The period of incubation is variable, 14 to 16 days. The prodrome is short, and characterized by moderate fever, headache, etc. The pustular eruption may be the first symptom noticed.

Complications are rare in ordinarily healthy children, but are severe when they do occur. The child should receive *good general nursing care,* and should be prevented from scratching the eruptions, which, if numerous or distressing, should be kept moist and covered as in smallpox.

Prevention.—Vaccination with chicken pox virus can be used to confer rather brief immunity upon small children in a family where one case occurs. This is sometimes employed in children's institutions, where the spread of any sort of epidemic is serious.

Terminal disinfection is the same as for other exanthemata.

Scarlet fever (scarlatina) is caused by a hemolytic streptococcus (see page 179) known as *streptococcus scarlatinae.* The symptoms are caused by a soluble toxin produced by the bacteria. Scarlet fever is essentially a disease of early childhood, occurring oftenest from soon after birth to eight years. The black and the yellow races are relatively immune.

The discovery of the actual cause of scarlet fever and the resultant isolation of specific toxin and antitoxin and the development of the Dick skin test of immunity by Doctors George and Gladys Dick of the University of Chicago constitute one of the many dramatic and romantic stories of science.

The Dick Test of Immunity[1] is similar in character to the Schick test for diphtheria. A very tiny amount of streptococcus toxin is injected under the skin under carefully controlled conditions. If the individual is immune slight or no reaction will occur. If he

[1] Dick and Dick, "*The Dick Test,*" *Nation's Health,* October, 1927.

is not immune a characteristic redness will appear during the following 20 to 24 hours.

Symptoms.—The incubation is short, only 2 to 7 days. The prodrome may be brief and violent with abrupt chills, fever, convulsions in children, sore throat, and headache (Fig. 70). The rash may appear in 6 to 24 hours.

Complications.—The complications of scarlet fever are frequently more serious than the disease. The complications are listed in order of frequency of occurrence in a series of studies by the United States Public Health Service.[1] Otitis media or

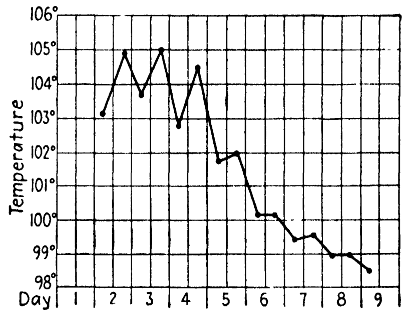


FIG. 70.—Temperature curve in a case of scarlet fever. (*From Osler, Principles and Practice of Medicine, D. Appleton-Century Company, Inc.*)

middle-ear infection which may extend to the mastoid cells is most frequent and always serious. Nephritis or disease of the kidneys is the next most frequent result of scarlet fever. It may appear some time after apparent recovery. Hence it is commonly advised that for some time following recovery occasional urinalyses should be made. Arthritis, or "scarlatinal rheumatism," characterized by redness and swelling of various joints, is an occasional complication, as is also swelling of glands (adenitis). Acute or chronic infection of the sinuses and tonsils also may occur.

Treatment.—An antitoxin for treating the disease has been produced by repeatedly inoculating horses or other animals with the toxin, but its effectiveness is still in question. Convalescent serum is also being used.

Nursing care consists in very watchful general care with scrupulous observation of diet, etc., as ordered by the physician. The

[1] *Scarlet Fever Streptococcus Antitoxin,* U. S. Public Health Report, Dec. 18, 1931.

discomfort of the itching, burning eruption may be somewhat allayed by soothing applications as prescribed by the doctor.

Prevention consists in strict isolation of all cases of nasal and throat inflammation, as scarlet fever is contagious during the prodromal stage. It is highly contagious during the eruptive stage, and slightly so during desquamation. It is usual to keep patients in isolation until scaling is completed and, especially, until all sign of inflammation has disappeared from the throat and nose. This is usually about four weeks from the onset.

Since there is some uncertainty regarding the duration of artificial immunity, which probably does not last longer than 2 years in any case, it is not commonly advised that all children be immunized as in the case of smallpox and diphtheria. Children subject to exposure may be Dick-tested and (if not found to be immune) immunized at the first report of a case in the immediate community or school, although the validity of scarlet fever vaccination is still in doubt. The search for a scarlet fever toxoid (immunizing antigen) is complicated by the fact that laboratory animals are not susceptible to the scarlet fever germ in the same way that human beings are.[1]

Terminal disinfection should be as for other diseases, with special attention to the skin, ears, and nose.

German measles (rötheln) is a distinct disease the cause of which is not known but is believed to be a filtrable virus. It is characterized by a bright red eruption closely resembling mild scarlet fever or "scarlatina." It tends to run a brief, mild course with complete recovery. Like most other children's infections, it seems to be conveyed through the nose and throat. The period of incubation is long, 14 to 24 days. Catarrhal inflammation of the nose and throat precede the rash by 24 or 30 hours.

Complications are rare in cases receiving intelligent care.

Isolation with good nursing care, protection of the eyes, and the usual treatment of eruption and usual disinfection are indicated.

Measles (rubeola).—The cause of measles is unknown but is supposed to be a filtrable virus. It is one of the most prevalent and communicable of all contagious diseases. While measles is

[1] Beaumont and Dodd, *Recent Advances in Medicine*, p. 350, P. Blakiston's Son & Company, 1934

seldom fatal in itself it may open the way to bronchial pneumonia and other diseases. It is estimated that 100,000 deaths from such causes occurred in the United States during 1900 to 1911, and that an average of 10,000 deaths from measles, chiefly of young children, occur in the United States every year.[1] The highest incidence is found at seven years, but 90 per cent of the deaths from measles occur before five years of age. The schoolchild "catches" measles at school and gives it to the baby in the home, who is the one who goes into bronchial pneumonia and dies.

In New York City an investigation of 6,000 cases of measles showed that 48 per cent occurred under five years and 50 per cent between five and fourteen years, while only 2 per cent occurred after fourteen years. The startling thing shown, however, was that 95 per cent of all deaths occurred under five years.[2]

Adults are susceptible to measles, but there are so few adults who did not have measles in childhood that there are relatively few adult cases.

Symptoms.—The period of incubation lasts from 8 to 14 days; the prodrome lasts 3 or 4 days, during which time the child goes about with the typical symptoms of a cold. This is the most highly contagious period of the disease. By the time the eruption appears the child has thoroughly exposed every child with whom he has had contact. The germ gains entrance through the nose and throat. While the nose and throat are congested as in cold, certain small bluish spots known as "Koplik spots" appear upon the mucous membrane of the mouth and aid in early diagnosis when anyone is curious enough to look for them.

Good nursing care is all-important in measles, *especially in mild cases,* as it is in cases in which the child does not appear to be very ill that he is most likely to run about and expose himself and incur one or more of the dreaded complications. The eyes should be protected from direct light, and, during the stage of acute inflammation, wet compresses of boric acid solution may be applied.

Complications, in addition to the deadly and much feared bronchial pneumonia, are chronic ear infection, sinus and mastoid infection, eye trouble, kidney trouble, suppurating glands, and especially a generally lowered resistance to infections such that

[1] Rosenau, *op. cit.*, p. 207.
[2] Stimson, *Archives of Pediatrics,* January, 1922.

THE EXANTHEMATA (THE BREAKING-OUT DISEASES)

Name	Cause	Incubation period	Period of contagion	Mode of contagion	Symptoms	Treatment	Prevention
Smallpox (variola)	a filtrable virus	9 to 15 days	Until healing of all pocks	Mucous membranes and eruptions	Severe head- and backache, chills, fever, pustular eruption. In mild cases may be mistaken for chicken pox	Isolation. Medical applications to prevent scars	Vaccination before one year old. For adults every 7 years or every time of epidemic
Chicken pox (varicella)	a filtrable virus	14 to 16 days	Until all eruption is healed	Eruptions, also probably nose and throat	Mild fever, small pustular eruptions	Isolation. Soothing medical applications	Vaccination sometimes used in children's institutions
Scarlet fever (scarlatina)	Hemolytic streptococcus "carriers"	1 to 7 days, usually 2 to 4	As long as any infective secretions remain	Nose and throat, pus from ears, etc.	Sore throat, fever, eruption on about second day	Isolation. Medical to prevent kidney and sinus trouble. Convalescent serum	Dick skin test. Inoculation with scarlet fever antitoxin (passive) or with toxins (active)
German measles (Rubella)	Probably a filtrable virus	14 to 21 days	Until nose and throat are well	Same as measles	Mild fever, eruption resembling mild scarlatina	Isolation	Avoid contact
Measles (rubeola)	A filtrable virus	8 to 14 days	Until nose and throat are well	Nose and throat during prodrome	Sore throat. Symptoms of cold. Fever, eruptions about second or third day	Isolation, good hygiene, medical care to prevent complications especially pneumonia and ear trouble	Passive immunity with convalescent serum if older children have disease—may protect young children

children (and adults) frequently have tuberculosis, tonsillitis, colds, or influenza directly following an attack of measles.

Prevention consists first of all in excluding from every schoolroom every child who shows any sign of inflammation of nose and throat. Thus only can schoolchildren be protected from exposure to acute cases during the highly contagious prodromal stage.

Active cases should, of course, be strictly isolated. The germ, while extremely contagious, fortunately dies very quickly outside the body; therefore the disease is spread chiefly through person-to-person contact and little, if at all, through objects handled.

While it has been impossible to isolate the germ or make an immunizing serum from cultures, a serum has been made from the blood of persons convalescing from measles which is said to confer a temporary, passive immunity lasting about 6 weeks. This convalescent serum is being used in children's institutions and with younger children who have been exposed to active cases.

Thorough general cleaning up is sufficient for *terminal disinfection*, as the life of the germ is short.

References

BEAUMONT and DODD: *Recent Advances in Medicine*, P. Blakiston's Son & Co., 1934.

DICK, GEORGE F., and GLADYS H. DICK: "The Dick Test," *Nation's Health*, October, 1927.

ROSENAU, MILTON J.: *Preventive Medicine and Hygiene*, D. Appleton-Century Company, Inc., 1931.

Scarlet Fever Streptococcus Antitoxin, U. S. Public Health Report, Dec. 18, 1931.

SHERWOOD, NOBEL P.: *Immunology*, C. V. Mosby Co., 1935.

"Smallpox, Historical and Geographical Prevalence," *Health Bulletin for Teachers*, Metropolitan Life Insurance Company, September, 1935.

Statistical Bulletin, Metropolitan Life Insurance Company, May, 1931.

CHAPTER XXI

OTHER CONTAGIONS OF CHILDHOOD

Diphtheria is a serious disease the symptoms of which are produced by the toxins of the Klebs-Löffler bacillus, also known as Bacillus diphtheriae. It is most prevalent in the autumn and winter and among children five to seven years old—in other words those who are just entering school. Infants are born with high immunity, which lasts for only a few months. Formerly more than half of all cases of diphtheria died. Under present treatment with antitoxin practically no cases die in which the treatment is given early and properly. If treatment is delayed the antitoxin may kill the germs, but the toxins may already have caused irreparable injury.

The early symptoms of diphtheria are *local,* consisting of the formation of a tenacious gray exudate or membrane on the tonsils. The membrane may extend to the nose, larynx, and bronchi; the *general* symptoms are caused by the diphtheria toxin which may attack muscles, nerves, and blood vessels, causing failure in function of various organs. There are moderate fever and muscle pain.

Among the complications of diphtheria are paralysis of the muscles of the heart, larynx, or other parts of the body. Sudden death may occur from paralysis of the heart even during convalescence and after the taking of antitoxin. Hence the importance of keeping even mild cases at rest until full recovery. Indeed the diphtheria toxin is said to have selective action upon the heart. Paralysis of the muscles of swallowing or breathing may produce serious symptoms and even death.

Membranous croup (*laryngeal diphtheria*) occurs when the membrane which appears on the tonsils extends into the breathing passages, causing the victim to struggle for breath, with strident, whooping sounds. In extreme cases the child actually dies of asphyxiation unless promptly relieved. This never occurs in cases which have been treated with antitoxin. Membranous

croup does occur occasionally in unrecognized cases of diphtheria which have been thought to be only severe colds (see page 220).

Permanent injury to the tonsils, heart, kidneys, and adrenal glands may result from diphtheria. Pneumonia is occasionally associated with diphtheria. The toxins of diphtheria may permanently injure hearing and vision. All in all, diphtheria is a deadly and dangerous disease.

Prevention.—As has been stated in other pages (see page 200), it is now possible to determine susceptibility by means of the Schick test. It is possible to produce immunity with one injection of alum-precipitate toxoid, or several injections of toxin-antitoxin. Inoculation in infancy seems to confer permanent immunity. Here is the weapon with which diphtheria can be eliminated from human experience. The means of completely wiping out diphtheria is now available. Public education and concerted social action remain to be achieved.

Since diphtheria is not so virulently contagious as smallpox, inoculation has not commonly been made compulsory for school-children as has smallpox vaccination. It therefore depends upon the interest and intelligence of individual parents and upon the educational activity of health officials and welfare groups how thoroughly the children of any community are protected.

The present approved method of management of diphtheria is:

1. Immunization with *toxin-antitoxin* or *toxoid* before the infant is one year old. The reasons for this are (*a*) that young children show relatively slight reaction to the serum; (*b*) that they seem thereby to be immunized for life; (*c*) that they are protected during their most susceptible years, as statistics show the highest comparative death rates among very young children.

2. All children of preschool and school ages, or all children under twelve who have not been immunized, should be Schick-tested and immunized if the need is indicated; or, as is now approved by most school-health authorities, there should be routine inoculation of all nonimmunized children, since the inoculation itself is not much more of an operation than the Schick test and much time and expense are saved by the shortened procedure.

It has been demonstrated in certain communities where this program of immunization has been carried out that the disease

can be practically exterminated. New Haven, Connecticut, a city with an enormous foreign population, but with a very effective city health department, in 1933 had not had a death from diphtheria for several years, and several districts in New York City show similarly gratifying results.

Since diphtheria is frequently spread by healthy carriers, especially by carriers who work in dairies or as food handlers, the identification, isolation, and treatment of carriers are important (see page 188). It is very difficult to sterilize carriers. Gargles are ineffective. Treatment with vaccines is sometimes successful.[1]

The fact that the initial stages of diphtheria may closely resemble common sore throat constitutes another vital reason why ailing children should be strictly excluded from schoolrooms.

Nursing Care.—Rest in bed until full recovery is the most important item. The feeding, medication, etc., will be prescribed by the physician. The entertainment of a child convalescing from diphtheria is particularly important and particularly difficult because of the necessity for relieving the heart of all strain.

Of course all discharges from nose and throat must be promptly sterilized by burning. All dishes, towels, washcloths, and clothing should be sterilized at once. Playthings and everything handled by the child should be sterilized by heat, fumigation, or disinfecting solution.

Whooping Cough (pertussis).—Whooping cough is doubtless caused by the Bordet-Gengou bacillus, although there is evidence of a virus which frequently complicates the picture.[2] It is most prevalent among children three to six years of age, but 92 per cent of the deaths occur in children under three, and 60 per cent in infants under one year.[3] In the United States in the years 1900 to 1921 the mortality rate averaged 10.5 per 100,000 of population and was higher than that from measles or scarlet fever. In England and Wales in 1891 the death rate from whooping cough

[1] Beaumont and Dodd, *Recent Advances in Medicine*, P. Blakiston's Son & Company, 1934.

[2] *A Textbook of Medicine by American Authors*, p. 307, W. B. Saunders Company, 1935.

[3] Bulletin, Metropolitan Life Insurance Company, September, 1931.

was higher than that from measles, diphtheria, scarlet fever, or typhoid fever.[1] Approximately 10,000 children die annually in this country from whooping cough.

Infants are born with little if any immunity. The largest number of deaths occur between six months and one year. Rosenau says there is no natural immunity; all children are susceptible. There probably are no healthy carriers.

The germs are conveyed from child to child through the nose and throat discharges and die very quickly on leaving the body. The disease is most contagious during the catarrhal or prodromal stage before the characteristic whoop appears. It is now believed that many mild cases never whoop, and that these are instrumental in starting and spreading many epidemics.

Symptoms.—The incubation period may extend from 7 to 14 days after exposure. The prodromal state, during which the child appears to have a cold, and may or may not cough, may last from one to two or three weeks. There is not much illness or fever. This stage passes into the paroxysmal phase, during which the child "whoops" when he coughs and has fits of spasmodic coughing, during which he tries frantically to dislodge the mucus in the throat. A coughing spell may last so long and be so violent that the child becomes exhausted and finally vomits. Children sometimes rupture themselves, causing umbilical hernia. The eyes become bloodshot; the child may lose so much food that his nutrition is seriously impaired. Very young children and infants who do not cough and expectorate effectively easily go into bronchial pneumonia, which causes the death of most children who die of whooping cough. Children with unstable nervous systems, or already undernourished because of lack of minerals and vitamins, may have convulsions. The paroxysmal stage may last for days or weeks; longer with the shut-in children in winter, and shorter in summer or in a climate such that the child can live in the open air and sunshine.

Treatment.—A pertussis vaccine has been used for some time. Some doctors think it shortens the attack and others are doubtful.[2]

[1] Rosenau, Milton J., *Preventive Medicine and Hygiene*, p. 228, D. Appleton-Century Company, Inc., 1931.

[2] Holt, L. Emmett, Jr., *A Textbook of Medicine by American Authors*, p. 311, W. B. Saunders Company, 1935.

In extreme cases sedatives are used to lessen the number and frequency of attacks.

Prevention consists, first of all, in avoiding respiratory infections and keeping the natural resistance up to par. The mother must then follow the advice of her pediatrician as to the use of immunizing vaccine. The reports as to the immunizing value of vaccines and serums have been conflicting. It seems fairly certain that the newer methods confer lasting immunity, but immunity is slow in developing, requiring some four months for completion.[1]

Nursing and care are all-important. The child must be fed an abundance of easily digested food in frequent but small amounts, especially just following paroxysms of coughing in order to secure as much assimilation as possible before the next coughing fit. Solid food is less apt to be vomited than fluid. On the other hand easily digestible fluids such as peptonized milk are more quickly absorbed. Probably the best plan is to give the child small well-balanced meals and feed him often, in order to get as much nourishment absorbed as possible. *Careful attention must be given to the amount of water retained.* Water should be given as often as food, but half an hour or so before giving food.

Since excitement, laughing, crying, and activity all bring on attacks of coughing, it is desirable to keep the child quietly and happily amused and in the open air. There is great value in sunshine, in other words, ultraviolet rays. A child should spend all the time possible in sunlight. If it is cloudy, he may have mercury-vapor quartz or carbon arc-light treatments.

A snug binder about the abdomen, especially in the case of the small child, protects from rupture and adds much to comfort, since the child then coughs against the binder instead of straining his abdominal muscles, which sometimes become very sore from constant strain.

No terminal disinfection is required.

Mumps (epidemic parotitis).—The germ causing mumps has not been isolated but is believed to be a filtrable virus. It attacks the parotid glands in front of the ear and occasionally the

[1] Sauer, Louis W., "Immunization against Whooping Cough," *American Journal of the Diseases of Children*, January, 1935; "The Known and Unknown of Bacillus Pertussis Vaccine," *American Journal of Public Health*, November, 1935.

sublingual and submaxillary glands. The germs enter through the mucous membranes as in many other diseases, and are conveyed from person to person through secretions from nose and throat. It is most prevalent between seven and nine years of age. One attack seems to confer lasting immunity.

Symptoms.—The period of incubation is long, 2 to 3 weeks. There is usually no special prodrome, soreness at the angle of the jaw being the first symptom noticed. Intense pain is caused by the admixture of acids with the saliva, hence the classic "pickle test." The swelling may be limited to one side, but usually one gland after another is affected until all are involved. There is more or less pain in chewing; sometimes there is a mild degree of fever with general languor.

Complications are rare in young children. Adults, and occasionally children, may have inflammation of the glands of the breasts, ovaries, testicles, or pancreas. In boys after puberty and in men the secondary infection of the testicles may be serious enough to cause sterility. In severe or complicated cases other organs of the body may become involved.

Treatment.—No medical treatment is indicated in ordinary cases. The mouth should be kept clean with antiseptic washes, the diet nourishing but easy to swallow. The patient should be kept quiet and in an even, mild temperature. Hot applications relieve the pain and stiffness to some extent. Some use is being made of *convalescent serum* in immunizing children who have been exposed. This seems to confer considerable immunity.

No terminal disinfection is necessary.

Infantile paralysis (anterior poliomyelitis), is a disease of infancy and early childhood, more than half the cases occurring under three years, although adults occasionally contract it. It is not so violently contagious as the other so-called children's diseases; probably more persons are naturally immune. It is believed to be communicated through the mucous secretions of infected persons, or by healthy carriers, possibly by insect carriers and infected milk.

The germ is now believed to be a filtrable virus. The inflammation in the tissues causes pressure upon the motor nerve cells of the spinal cord, which causes them to cease to function. If this is continued long enough it causes death of the nerve cells in

the cord and permanent paralysis. If the inflammation subsides before permanent injury is done, recovery or improvement takes place during the course of weeks or months. It is thought that many mild cases occur without paralysis and thus go undetected, but play a part in the spread of the disease.

Symptoms.—The period of incubation is from 7 to 10 days. The prodrome lasts 2 to 4 days before the appearance of the paralysis which makes the diagnosis certain. Fever and pain last for a variable number of days and gradually subside.

Treatment.—The blood serum from individuals who have had the disease is now used to shorten the attack and prevent paralysis. Not all such persons have "viricidal" serum, however; therefore it is advisable to have therapeutic serums tested for potency.[1] It is reported that a horse serum has been produced having curative properties. It is impossible to say how effective this may prove to be.[2] Immunization with live virus has been attempted, with conflicting reports as to results. It seems to be the general opinion that there is some danger of actually infecting the subject of inoculation.[3]

Nursing.—Until all pain and tenderness are gone, the child should be isolated, kept very quiet, handled with the greatest gentleness, and kept warmer than usual on account of the poor circulation to the involved parts.

Aftercare.—The care of infantile paralysis following the acute stages is being increasingly stressed as important.[4] Careful

[1] FABER, HAROLD, "Transfusion Donors of Immune Serum for Treatment of Poliomyelitis," *Journal of the American Medical Association,* Mar. 21, 1931.

[2] NEUSTACDTER, MARCUS, "Antipoliomyelitis Horse Serum," *Journal of the American Medical Association,* Mar. 21, 1931.

[3] "A New Test for Immunity to Infantile Paralysis," *Parents' Magazine,* June, 1935.

"Infantile Paralysis Vaccines," editorial, *Journal of the American Medical Association,* Oct. 19, 1935.

PARK, WILLIAM H., "Should We Vaccinate against Infantile Paralysis?", *Parents' Magazine,* March, 1935.

[4] DICKIE, WALTER M., "After Care of Poliomyelitis," *Journal of the American Medical Association,* Nov. 10, 1928.

AMESSE, J. W.: "Treatment of Infantile Paralysis," *American Journal of the Diseases of Children,* April, 1928.

COLONNA, PAUL C., "The Care of Infantile Paralysis," *Hygeia,* August, 1936.

OTHER CONTAGIONS OF CHILDHOOD

Name	Cause	Incubation period	Period of contagion	Mode of contagion	Symptoms	Treatment	Prevention
Diphtheria (membranous croup)	Klebs-Loffler bacillus	1 to 5 days	During prodrome and symptoms and may be carrier for indefinite period	Secretions from nose and throat	Sore throat with patches, fever, prostration	Isolation. Antitoxin. Prolonged rest to prevent paralysis	Toxin-antitoxin or toxoid before 1 year. Schick test for older children and adults
Whooping cough (pertussis)	Bordet-Gengou bacillus	7 to 14 days	During prodrome and as long as coughing spray, about 4 weeks	Secretions from nose, throat, and bronchi	Cold, fever, cough—usually, but not always, "whooping" paroxysms	Isolation—fresh air, frequent feeding, binder to protect abdominal muscles. Pertussis serum recommended	Prevent contact. Pertussis serum may immunize
Mumps (epidemic, parotitis)	Probably a filtrable virus	4 to 25 days	During symptoms	Saliva	Acute, painful swelling of salivary glands, mild fever	Isolation. Good hygiene to prevent infection of other glands	Prevent contact
Infantile paralysis (anterior poliomyelitis)	Probably a filtrable virus	7 to 10 days	During prodrome and acute symptoms, may remain a carrier	Secretions from nose and throat	Fever, pain on movement—eventually paralysis	Isolation, good nursing. After treatment for paralysis	Prevent contact. Convalescent serum may have value

identification of the special muscles involved should be made by galvanic tests. The mother of the child should then be taught the appropriate muscle-training exercises and massage and electrical treatments, and she will have to devote herself to the daily routine performance of these as her supreme, sacrificial service to her child. They should be carried out diligently and unceasingly during the growing years, at least as long as the slightest improvement is discernible. Corrective exercises while the patient is floating in a tank of tepid water furnish one of the most effective procedures in many cases. Swimming and other spontaneous exercises are usually encouraged. Surgical lengthening or shortening of ligaments is sometimes necessary, and the wearing of properly fitted braces is often indicated.

Every such child should be under the supervision of a good orthopedist (a specialist in crippling diseases) during all of his growing years. An amazing degree of improvement is being secured by patient, unending effort. It is worth the necessary sacrifice.

The psychology of the situation is an important factor. Both mother and child must strive for a cheerful, normal morale, and develop a sporting attitude toward the trying and monotonous routine. Every effort should be made to keep a partially disabled child agreeably occupied to prevent his brooding upon his misfortune. His education should not be neglected. He, of all children, should have the service of enlightened and understanding teachers. Especially wise management is necessary in order to avoid "spoiling" the child and injuring his personality.

No terminal disinfection is necessary.

References

AMESSE, J. W.: "Treatment of Infantile Paralysis," *American Journal of the Diseases of Children*, April, 1928.

"A New Test for Immunity to Infantile Paralysis," *Parents' Magazine*, June, 1935.

A Textbook of Medicine by American Authors, p. 307, W. B. Saunders Company, 1935.

BEAUMONT and DODD: *Recent Advances in Medicine*, P. Blakiston's Son & Company, 1934.

COLONNA, PAUL C.: "The Care of Infantile Paralysis," *Hygeia*, August, 1936.

DICKIE, WALTER M.: "After Care of Poliomyelitis," *Journal of the American Medical Association*, Nov. 10, 1928.

Editorial, "Infantile Paralysis Vaccines," *Journal of the American Medical Association*, Oct. 19, 1935.

FABER, HAROLD: "Transfusion Donors of Immune Serum for Treatment of Poliomyelitis," *Journal of the American Medical Association*, Mar. 21, 1931.

NEUSTACDTER, MARCUS: "Antipoliomyelitis Horse Serum," *Journal of the American Medical Association*, Mar. 21, 1931.

PARK, WILLIAM H.: "Should We Vaccinate against Infantile Paralysis?", *Parents' Magazine*, March, 1935.

POPE, MARGARET: "Water Treatment after Infantile Paralysis," *Hygeia*, April, 1924.

ROSENAU, MILTON J.: *Preventive Medicine and Hygiene*, D. Appleton-Century Company, Inc., 1931.

SAUER, LOUIS W.: "Immunization against Whooping Cough," *American Journal of the Diseases of Children*, January, 1935.

———: "The Known and Unknown of Bacillus Pertussis Vaccine," *American Journal of Public Health*, November, 1935.

STAFFORD, GEORGE T.: *Preventive and Corrective Physical Education*, Chap. XI, "Treatment of Infantile Paralysis," A. S. Barnes & Company, 1928.

CHAPTER XXII

CONTAGIOUS DISEASES AFFECTING THE RESPIRATORY TRACT

The Common Cold.—If the trail of the common "head cold" could be marked in red there is no doubt that its lurid path would be seen leading to an appalling number of illnesses and conditions not commonly charged to its account.[1] The conquest of the cold is the first step in the conquest of the acute infections of childhood. since most of these diseases are acquired by way of nose or mouth and begin with the general symptoms of a cold. During the most contagious period, because the mother thinks her child "only has a cold," he often mingles freely with other children.

The cold itself is no trivial thing. It lowers resistance, the ailing one does not eat or sleep well, and general efficiency is impaired. The inflammation of nose and throat predisposes to chronic infection of adenoids, tonsils, sinuses, and ears. Immunity to other diseases is lowered, and "just a cold" is often followed by pneumonia, tonsillitis, influenza, or other serious infections. One should feel the same kind and degree of guilt in exposing another person to a cold as he would in exposing him to diphtheria or smallpox. One should avoid exposing himself to cold infection as strictly as he would avoid the diseases of which he has acquired a definite fear.

Causes.—The common cold is an acute infection caused by several known germs and probably one specific unknown germ, a filtrable virus, which attack the mucous lining of the nose and may extend to the throat. The severity of the cold depends upon the condition of resistance or immunity present in the body at the particular time, and also upon the particular combination or "mixture" of germs to which the individual has been exposed.

Surface chill, especially when accompanied by fatigue or undernourishment, lowers the metabolism and general immunity, causes

[1] "Progress in the Study of the Common Cold," *Science Supplement*, Feb. 21, 1936.

congestion of the mucous membranes, and creates a condition favorable to the growth of germs on the membranes. On the other hand, a cold bath or exposure to cold, if one reacts with surface glow and warmth and a sense of increased vigor, raises the basal metabolism and increases resistance.

The presence of the proper amount of minerals in the body fluids, especially calcium and phosphorus, together with the presence of the vitamins D and C, which enable the body to take

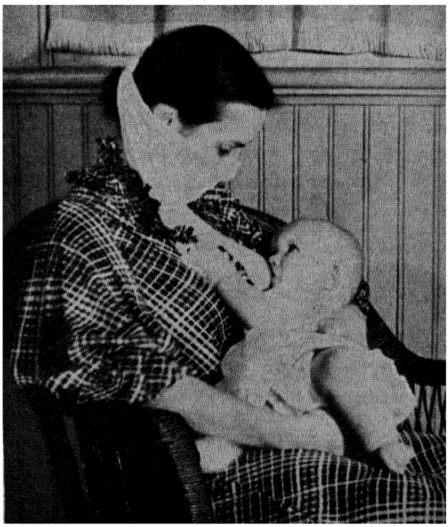


FIG. 71.—A nursing mother wearing a mask.

up or utilize the minerals, seems to increase resistance or immunity to colds and other respiratory infections. The health and immunity of all mucous membranes also depend somewhat specifically upon the presence of vitamin A (see page 86), especially an abundance of vitamin A in the diet during the early growing years.

Prevention of Colds.—Every person should try to prevent taking cold by keeping the air he breathes moving, clean, moist, and cool, by exercising freely out of doors every day, and by training the skin of the body through daily air-, sun-, and water-baths, and through friction. Everyone should scrupulously avoid contact with those having cold infection.

Every mother should take all precautions to keep her children from exposure to the germs of the common cold. No one should ever kiss any child upon the mouth. The mouth does not exist which is clean enough or free enough from germs to be applied to the mouth of a child. No one having a cold should handle or come within "breathing distance" of a child.

If the mother of an infant has a cold she should scrub her hands before touching the baby and should avoid breathing on it. She should not blow her nose or handle her handkerchief while caring for it. If her condition is very acute she should tie a fresh, clean mask over her mouth while nursing her babe (Fig. 71).

Treatment of Colds.—The first thought should be the protection of others. No one has a moral right forcibly to expose others to the unpleasant experience of a cold infection. The schoolchild should be kept at home. This is for his own sake, in order that he may quickly recover, and also for the school's sake, because nothing is more demoralizing to school work than an epidemic of colds and because no one, often not even a physician, can know whether the condition is a cold or the beginning of diphtheria, measles, scarlet fever, whooping cough, or one of several other contagious diseases. If the cold is slight and the sun is shining, a day in the open air and sunshine is the very best way to break up the ailment. If the weather is unpleasant or if the patient has fever, the best treatment is to go to bed for one day. The bowels should move freely, but nothing is gained by overvigorous catharsis. One should eat a light, nourishing diet with an abundance of juicy fruits, especially unlimited orange juice, lemonade, or tomato juice, and fresh water.

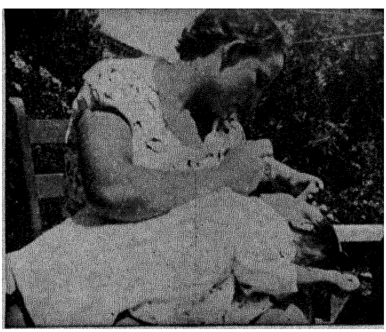


FIG. 72.—Dropping oil in a child's nose.

Anyone afflicted with a cold should use paper napkins or paper handkerchiefs on which to blow the nose. The nose of a child should be thoroughly cleaned with oil just before eating and before sleeping. The oil should be dropped up the nose with a pipette

while the child is lying with head thrown back (Fig. 72). The child should be taught to blow both sides of the nose equally without holding either nostril. Forcible blowing of one side only may drive infective material into the middle ear or other sinuses (see page 116).

Complications.—The "mixture" of germs causing any particular cold infection may extend their operations to the tonsils or other tissues of the throat, to the larynx (voice box), to the bronchial tubes, or into the sinuses.

Treatment.—Sprays and gargles are now believed by some physicians to be of doubtful value. It is reported that X-ray pictures after gargling with mineralized fluid show that the fluid does not actually cover the tonsils.[1] There would, however, seem to be considerable certainty of the spread of the fluid even after the termination of the gargling contractions.[2] Vaccines have limited value unless made from one's own secretions (autogenous), since cold is always a mixed infection and stock vaccines seldom fit the individual mixture.[3]

Tonsillitis (sore throat) may accompany or follow a cold, or may occur independently. The tonsillar tissues may be "acutely" infected, with speedy recovery, or they may be "chronically" infected and the condition may continue indefinitely. When a sore throat appears suddenly and in severe form it is usually caused by streptococcus germs (see page 179) and is commonly known as "streptococcus sore throat." This may bring about severe illness or even death from toxemia.

General sore throat may show only redness with some swelling and tenderness, or it may show ulcerative patches, and the individual may have some fever and a feeling of general illness (malaise).

In any case showing "patches" upon the tonsils a doctor should be consulted, since the lay person cannot distinguish between the exudates of ordinary tonsillitis, of streptococcus sore

[1] "Gargling and Passive Irrigation," *Journal of the American Medical Association*, Sept. 15, 1934.

[2] "Gargles," *Journal of the American Medical Association*, May 9, 1936.

[3] HANGER, FRANKLIN M., *A Textbook of Medicine by American Authors*, p. 4, W. B. Saunders Company, 1935.

DIEHL, HAROLD S., *Healthful Living*, pp. 211–235, McGraw-Hill Book Company, Inc., 1935.

throat, and of diphtheria, and neglect of the two last-named infections in their early stages may be serious or fatal.

Home treatment consists in rest, a diet chiefly of milk and fruit juices, emphasis on water-drinking, and a mild cathartic if necessary, although violent purging of the bowels is no longer favored. The application of a cold wet compress relieves pain and promotes reduction of the swelling (see page 462). As just mentioned under colds, there seems to be some doubt as to the efficacy of ordinary gargling (see page 223), although it is a good thing to keep the mouth clean and the throat moistened by gargling with a mild alkaline solution. Thorough swabbing of the tonsils with iodine, mercurochrome, or hexylresorcinol (see page 366) will hasten destruction of the germs. The individual should stay quietly within doors, and if he has fever he should remain in bed.

Complications.—Acute rheumatic fever may follow acute tonsillitis; also infection of the lining of the heart (endocarditis); of the covering of the heart (pericarditis); middle-ear infection (otitis media); in fact any organ of the body such as the kidneys, bladder, or lungs, if not in normal condition, may be "secondarily" infected.

Chronic tonsillitis may be the result of repeated attacks of acute tonsillitis or of cold, or the tonsils may become chronically infected without previous acute infection. The tonsil (see page 116) because of its spongy cauliflowerlike structure furnishes crypts or hiding places for streptococcic germs milder in nature than those causing acute sore throat (see page 179). There may be no pain or tenderness, but the tonsils are usually more or less enlarged. The pus formed in the crypts is cheesy in appearance and offensive in odor. Pressing on the tonsil will sometimes cause the thick yellow pus to extrude.

The condition is established ordinarily in early childhood before the period of normal atrophy of the tonsils (see page 115), but may persist into adult years and, acting as a focus, set up heart and joint troubles at any time in the individual's life (see page 114).

The complications of chronic tonsillitis are mentioned under Focal Infections, page 254. The streptococcic germs may travel in the blood stream and cause secondary infection in heart, in joints, in nerve sheaths, or elsewhere. Increased susceptibility to

colds and lowered resistance to infections of all kind often accompany chronic tonsillitis.

Treatment consists in surgical removal. Local treatment is rarely effective because of the impossibility of reaching the germs buried deeply in the crypts.

Throat specialists are more conservative than formerly about removing tonsils in young children. They commonly try to tide the child over by treatment, if feasible, until the glandular changes of puberty have taken place. When tonsils are definitely diseased, however, they become dangerous, and the child must be deprived of the natural protection afforded by these glands in their normal state. While the surgical removal of tonsils is commonly regarded as a "minor operation," actually there are few operations requiring greater skill and judgment. Only a specialist of known ability should be trusted to do a tonsillectomy, particularly in a small child.

Adenoids (nasal tonsil) is the term used to designate the cauliflowerlike lymphoid gland situated on the back wall of the throat, where inspired air from the nose strikes the throat wall and is diverted downward into the bronchial passages. Because of its multiple lobes it is commonly referred to in the plural. The adenoid atrophies at puberty. It is likely to be affected by whatever affects the throat tonsils. An enlarged adenoid may obstruct normal breathing, and obstruction of breathing interferes with eating and sleeping. Pressure upon the delicate structures at the back of the nose and upon the passages from the nose and throat to the middle ear and various other cavities (see pages 115–116) may impair hearing and promote chronic sinus infection (see page 117). Obstruction of the nose causes mouth breathing and may alter the contour of the face.

The lingual or tongue tonsil is a small mass of lymphoid tissue upon the base of the tongue, which serves to complete the tonsilar ring.

Removal of enlarged adenoids is imperative whether or not the tissue is actually diseased, and whether or not the throat tonsils are also removed. Since the nasal (adenoid), throat (faucial), and tongue (lingual) tonsils are similar in structure and function, infection in one gland is likely to travel to the others, and it is usually necessary to remove both tonsils and adenoid.

Bronchopneumonia is the name given to any inflammatory condition of the small bronchial passages in the lungs. It may be caused by and complicate measles, whooping cough, influenza, and a variety of other diseases. It may occur independently as streptococcic or pneumococcic infection, but is most often secondary to some other illness. Any condition which lowers the resistance or irritates the tissues of the respiratory passages opens the way for the invasion of germs. Epidemics of bronchopneumonia from hemolytic steptocococcus occur, principally in populations reduced by war or famine.

Bronchopneumonia occurs in the very young and the very old. The high death rate from children's contagions such as measles, scarlet fever, and whooping cough is due chiefly to bronchopneumonia, which may occur as a serious complication in mild cases of the primary diseases.

In bronchopneumonia the bronchial tubes become obstructed with inflammatory secretions. The symptoms of the primary disease merge more or less gradually into those of the lung condition. Rapid, painful breathing, frequent coughing, fever, sometimes delirium may occur. As the obstruction increases breathing becomes more difficult, the blood is not sufficiently oxygenated, the face and lips become blue, and death may occur from asphyxiation.

Nursing, in addition to routine care, involves great watchfulness, particularly as to the temperature, pulse, and respiration, keeping the body uniformly warm; keeping the air in the room fresh and moving and at the temperature indicated by the doctor. Keeping up the nutrition by giving easily digested food at frequent intervals is important. Careful disposal of the sputum (see page 384) is a routine duty in any illness accompanied by cough and expectoration.

Lobar pneumonia or true pneumonia is caused by a specific germ, the diplococcus pneumoniae. There are many (30 or more) types of the pneumonia germ. The very young and the very old are most likely to contract lobar pneumonia. The Negro race is more susceptible than the white. Pneumonia usually begins suddenly and ends suddenly. The individual is very ill with high fever while the illness lasts, but the fever breaks abruptly as a rule (see page 340). When complicated with bronchitis it begins and

ends more gradually. As with bronchopneumonia, lobar pneumonia may occur as a complication in the course of other diseases, but usually occurs independently.

Treatment.—Serum inoculations are used with varying success in types I and II. The secretions must be cultured and "typed," and a serum of the appropriate type used.

Nursing is of the utmost importance in all forms of pneumonia. Supporting the strength by careful feeding and conserving the body function becomes the constant duty of the nurse. The air in the room must be kept moist and fresh, and, especially, must be kept uniformly at the temperature ordered by the physician. As some prescribe fairly cold air and others warm air, it is probable that the uniformity and freshness are the most important features.

Since the breathing passages are congested and clogged with secretions the pneumonia patient breathes rapidly and with difficulty (sometimes 50 to 60 times per minute or even 80 in children). He struggles for breath and likes to be propped up on pillows, and cannot bear to have his arms pinned down with covers. The chest and arms must be protected by putting sweaters or pajama jackets on backward. A "pneumonia jacket" may be made by basting cotton wadding inside any waist-like garment.

The patient coughs frequently and painfully. The sputum may be tinged with blood, which is rust color owing to mixture with the bronchial secretions. Absorbent paper should be used to receive the expectoration and should be placed in paper sacks and burned (see page 384).

Prevention.—The immunizing value of vaccine inoculations is not yet fully determined. One attack does not confer immunity. Persons have been known to have 10 to 20 attacks during a lifetime. There is a great deal that is still baffling and obscure as to the manner of transmission and behavior of the various types of pneumonia. The best means of prevention known at the present time is to avoid *all* infections of the respiratory tract, and keep the general bodily immunity at a high level.

Influenza ("La Grippe," "Flu") is perhaps the most highly contagious disease known to human experience. It is characterized by sweeping, wavelike epidemics (pandemics) which encircle the traveled world. In the great pandemic of 1918 to 1919 it is

estimated that over 200,000,000 cases occurred with 10,000,000 deaths within a period of 12 months. In the United States alone there were, in less than 6 months, more than 20,000,000 cases with 450,000 deaths. In India, during 6 months of the same pandemic nearly 5,000,000 deaths from influenza were reported.[1]

The cause of influenza is not yet definitely determined. The Bacillus influenzae, or "Pfeiffer's bacillus," is found in many cases, but bacteriologists in general do not agree as to the specific character of this germ, since it is found in many normal throats and cannot always be demonstrated in typical cases of flu. There seems to be a growing tendency to assume that a filtrable virus is the specific cause[2] and that secondary infection from Pfeiffer's bacillus, pneumonia, streptococcus, cold virus, etc., often, if not usually, complicates the clinical picture.

The manner of communication is strictly person to person, probably chiefly if not entirely from infected breathing passages. Since sneezing and coughing are early symptoms it is easy to see how the germs may be widely scattered. During the pandemic of 1918 the disease traveled around the world at about the rate of human travel. It was accurately predicted when the "wave" would reach given places. It crossed the United States from west to east, reached New York, crossed the ocean on boats and traversed Europe in the same manner. Rosenau says, "It moves from place to place in a pair of shoes."

The symptoms of influenza are varied but have certain well-known characteristics. The period of incubation is short; one may fall sick within 24 hours after exposure. The first symptoms are those of common cold: catarrhal condition of eyes, nose, and throat with copious secretions. The "three-day fever" is characteristic of uncomplicated cases. Chilliness, backache, and headache usually occur. The outstanding characteristic of genuine influenza is the extreme weakness and prostration which are out of all proportion to the apparent seriousness of the illness. In uncomplicated cases the disease tends to run a typical course with

[1] ROSENAU, MILTON J., *Preventive Medicine and Hygiene*, p. 241, D. Appleton-Century Company, Inc., 1931.

[2] "Science Review of the Year," *Science Supplement*, Jan. 3, 1936.

THOMAS, FRANCIS, "Recent Advances in the Study of Influenza," *Journal of the American Medical Association*, July 27, 1935.

slow but complete recovery. It is doubtful if death ever occurs from influenza alone.

Complications.—The complications are the serious feature of influenza. On account of the great prostration the patient easily contracts pneumonia, sometimes called "flumonia" (which causes most "flu" deaths), meningitis, encephalitis lethargica (sleeping sickness), heart trouble, etc.

Nursing and Medical Care.—Medical care is not very well standardized. Some use is being made of serums with variable results. Chiefly, medical treatment consists in watchful support of the patient's vitality with treatment of symptoms. Nursing care is important; *even mild cases should remain strictly in bed for at least* 24 *hours after the temperature is normal,* and no one, no matter how mild the attack may seem to be, should force himself to disregard the fatigue and prostration, as this is the most frequent cause of relapse and complications.

Prevention, as with other respiratory infections, consists, first of all, in avoiding contact with active cases and, conversely, in observing strict isolation when one has symptoms of the disease. Secondly, as always, one should avoid fatigue and keep one's general condition (natural immunity) up to the highest possible level by getting an abundance of sleep and fresh air and eating freely of pigmented foods.

Tuberculosis, commonly called "The Great White Plague," is one of the most prevalent of the serious diseases afflicting the people of the world today. While there are wide differences in the immunity of various races and nationalities, Jews and Italians being very resistant and Irish, American Indians, and Negroes highly susceptible, no race or nationality is entirely immune. While it is more prevalent in climates such that the people spend much time indoors, no climate is exempt. While both the incidence and the mortality are the highest for the adolescent period, the disease occurs from birth to old age. While it is not hereditary, there are cases recorded of placental infection being communicated to the unborn child, and a tuberculous mother may infect her child very soon after it is born. While the great majority of active infections center in the lungs, and muscular tissue is seldom the site of infection, nevertheless almost every tissue of the body does, in some instances, become involved.

Add to these conditions the fact that the usual onset of tuberculosis is very gradual and that the victim walks around, actively exposing others, for months and even years, and we can understand why the disease is indeed a deadly and insidious plague. The situation is further complicated by the fact that there is no known remedy or cure; all science can yet do is to use to the fullest extent "the healing power of nature" in the forms of food, air, sunlight, and rest.

Tuberculosis is not confined to the human animal, there is a bovine (beef) type, an avian type (affecting fowls and other birds) and even a type which attacks cold-blooded animals, such as fish. Human beings are not very susceptible to animal types with the exception of bovine tuberculosis, the germs of which are found in milk. Milk constitutes a large part of the diet of the infant and young child and the child is particularly susceptible to the bovine bacillus. Rosenau says 25 per cent of all cases of tuberculosis in children is of the bovine type. This suggests the importance of using only pasteurized milk or certified milk from tuberculin-tested cows.

Owing to the universal practice of cooking, tuberculosis is seldom if ever transmitted to human beings by fowls and eggs, although domestic fowls which are kept confined may die of it.

Tuberculosis is essentially a disease of the indoors. Rosenau says, "It is a disease of cattle in barns, not on the range; chickens in coops, not birds in nature; monkeys in zoos, not in the jungle; men in houses, not the primitive races."[1] It may be said to follow the path of civilization wherever said "civilization" has forced human beings to shut themselves away from sunlight and air in offices, tenements, factories, and apartments and compelled them to live upon devitalized and insufficient food. It is a class disease, in that it is much more prevalent among the poor than among the rich. However, for reasons stated, the poor distribute germs of this and other diseases with great impartiality, and the individual of any class, particularly the young individual, whose resistance becomes low may fall a prey to the disease.

Cause and Source of the Disease.—The disease is caused by the tubercle bacillus, a small, rod-shaped germ discovered in 1891 by Robert Koch, a German scientist. The bacillus is resistant to

[1] ROSENAU, *op. cit.*, p. 157.

cold and to putrefaction. It will live for a year in water and for a long time in dried sputum. It dies rather promptly in direct sunlight and under complete drying. Live germs have been found in outdoor dust, although it is the dust in infected houses which is particularly dangerous. It is now believed that many cases of lung tuberculosis are acquired through fingers and food contaminated by secretions, and that tuberculosis infections may enter the body by way of the membranes of the nose and throat or digestive tract and be carried to the lungs as well as other tissues by the lymphatics and blood vessels. Contact infection from inhaling the breath, especially from the coughing of a tuberculous person, occurs, doubtless, much oftener than is known, when we think how many active cases use public conveyances and associate in industry with the public at large.

Since lung tuberculosis is characterized by copious secretion and expectoration, and since people generally are criminally careless in the disposal of sputum and in the disinfection of hands, it is obvious that probably no one, unless a hermit, escapes frequent and repeated exposure to living germs.

Many children (10 to 25 per cent) have at one time or another some degree of active infection, not producing recognizable symptoms but sufficient to leave record in the form of caseous tubercles in lungs or other organs. At least such evidence is frequently found in X-ray pictures and in autopsies. At any time later in life when conditions are favorable the caseous nodes in the lungs may break down, releasing imprisoned germs which may set up an active infection. The reinfective type is the most deadly to the adult who has been sensitized (see page 196) by having had the childhood type.

Indirect causes are all the things which lower natural immunity and vitality: underfeeding, lack of protective factors (vitamins and minerals) in the diet, fatigue, exposure, previous illness, particularly illness localized in respiratory membranes such as cold, measles, and influenza.

Owing to better living, better public health administration, better health education in the schools, etc., the general death rate in this country from tuberculosis has steadily declined. (Rosenau says, however, that 100,000 persons still die annually in the United States of tuberculosis.) Curiously, this decline is true for

every age and class except that of adolescent girls. According to one report of the Metropolitan Life Insurance Company covering a period of ten years (1911 to 1920) the death rate among adolescent boys had declined 25 per cent, while that among adolescent girls had increased 5 per cent. Dr. S. Adolphus Knopf of New York, commenting in 1928 upon this still continued situation attributes this startling state of affairs to "scanty clothes, reducing diet, bad hygiene at home and at work, the

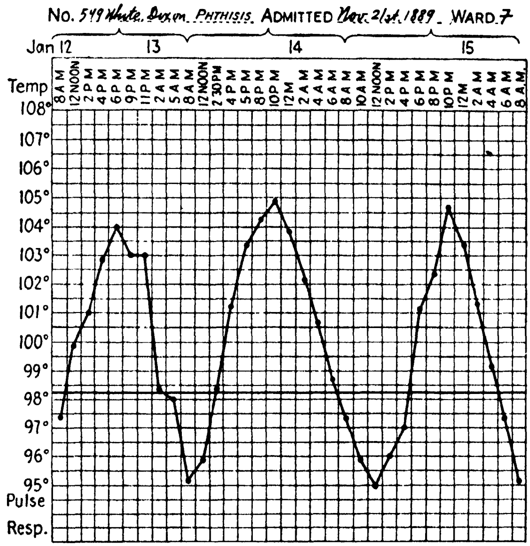


Fig. 73.—Three-days temperature curve in advanced tuberculosis. (*From Osler, Principles and Practice of Medicine. D. Appleton-Century Company, Inc.*)

wearing of shoes which prevent walking for exercise, and tight brassières."[1]

Clinical Symptoms.—In infancy and childhood glandular and bone infections predominate. Orthopedic clinics and children's hospitals are filled with cases of bone infection. With adolescence lung infection leads. Tuberculosis may attack the brain (tuberculous meningitis), the vital organs, the skin, etc. Miliary or general tuberculosis may attack many parts of the body at once.

[1] Knopf, Adolphus, "Tuberculosis among Young Women," *Journal of the American Medical Association*, Feb. 18, 1928.

The lung type (phthisis, "consumption") may begin very insidiously with loss of weight and strength, often slowly over a period of time. A very slight daily rise of temperature, usually in the late afternoon, is a characteristic feature. (In advanced cases the temperature may rise daily to 103° to 104° (Fig. 73).) These symptoms may precede definite lung symptoms such as cough or expectoration. Tuberculin skin tests, notably the Mantoux or Old Tuberculin test, have considerable diagnostic value in human beings, and tuberculin tests have specific value in detecting bovine tuberculosis.

Where many tubercles form, the surrounding tissue may die from pressure or crowding and break down, producing the characteristic "cheesy" exudate of advanced cases. These masses may break loose in the lungs, causing hemorrhage. The destruction of tissue with release of toxins continues progressively, in fatal cases, until some vital function becomes too impaired longer to support life.

Treatment.—There is no antitoxin and no effective serum treatment known. The most effective treatment is that of fostering the natural strength and resistance to the utmost by rest, change of scene if indicated, and, especially, direct sunlight supplemented by artificial ultraviolet rays; out-of-door life; and, very especially, an energy-giving and tissue-building diet, with emphasis upon animal protein, the vitamins, and all of the minerals, particularly calcium, phosphorus, and iron.

Artificial pneumothorax is a form of treatment formerly confined to advanced cases, but now being applied also to early cases. This consists in inflating the pleural cavity between the lung and the chest wall on the most diseased side with gas, thus collapsing the air cells and putting the lung "at rest." The operation seems to arrest the progress of the disease and prolong life, sometimes quite definitely. In early cases it may shorten the required period of total rest.

Prevention consists: (1) in early diagnosis and supervision of incipient cases. No one in a rundown condition should resent a tentative diagnosis of tuberculosis. The treatment indicated is also that best for *any* rundown condition, and early arrest is accomplished much more quickly and certainly than later when the symptoms, such as bacilli in the sputum, become unmistak-

able. (2) Every community should provide adequate official health supervision in the way of public health nurses, health officers, etc., to protect the public against forcible infection by persons who do not voluntarily come under medical care, and who are too ignorant to observe proper rules of hygienic conduct. (3) There should be public sanatoria and hospital facilities for the care of all indigent, homeless, and advanced cases.[1] (4) There should be close supervision of milk production with periodical medical examination of all food handlers. (5) Every community should provide vitalized health instruction in the public schools, with facilities for providing every child with such food and medical care as will maintain his health and resistance at a high level. (6) There is some reason to believe that a method of producing artificial immunity may have been discovered. Two Frenchmen, Calmette and Guerin, grew a strain of tubercle bacilli over a period of 15 years, finally producing a very weak strain, which is said not to produce tuberculosis when live bacilli are injected into even an infant, but which will create a more or less lasting immunity. This vaccine is called "B. C. G." (Bacille Calmette-Guerin). Calmette advises that the vaccine be given by mouth within 10 days after birth. It is reported that 88,000 children in France alone have been vaccinated without any accident from the use of the vaccine, and that the death rate among infants in tuberculous families, which was formerly 24 per cent before the age of one year, has been reduced to .9 per cent. While some use is being made of "B. C. G." in the United States, it is yet in the experimental stage and is not yet generally accepted or employed in this country.

References

Brailey, Miriam: *Factors in Detecting Childhood Tuberculosis*, Child Health Bulletin, July, 1934.

Diehl, Harold S.: *Healthful Living*, McGraw-Hill Book Company, Inc., 1935.

Do Children Have Tuberculosis? Pamphlet of the National Tuberculosis Association, New York. Also a Bibliography of Publications on Tuberculosis.

[1] Editorial, "Tuberculosis." *Hygeia*, January, 1936. There are today 18,204 sanitariums, departments, and preventoriums for the tuberculous in the United States, providing some 100,000 beds. There are probably half a million children with tuberculosis in some form.

Editorial, "Tuberculosis," *Hygeia*, January, 1936.

"Gargling and Passive Irrigation," *Journal of the American Medical Association*, Sept. 15, 1934.

"Gargles," *Journal of the American Medical Association*, May 9, 1936.

KNOPF, ADOLPHUS: "Tuberculosis among Young Women," *Journal of the American Medical Association*, Feb. 18, 1928.

MEYERS, T. ARTHUR: *The Child and the Tuberculosis Problem*, Chas. C. Thomas Co., 1932.

"Progress in the Study of the Common Cold," *Science Supplement*, Feb. 21, 1936.

ROSENAU, MILTON J.: *Preventive Medicine and Hygiene*, D. Appleton-Century Company, Inc., 1931.

"Science Review of the Year," *Science Supplement*, Jan. 3, 1936.

THOMAS, FRANCIS: "Recent Advances in the Study of Influenza," *Journal of the American Medical Association*, July 27, 1935.

CHAPTER XXIII

INFECTIONS OF THE DIGESTIVE TRACT

The infections commonly affecting the digestive tract gain entrance to the body through food or drink; in other words they must be swallowed. There are numerous agencies through which germs may be communicated to food, among which are: insect carriers, especially flies; human carriers who handle and contaminate food or food containers and utensils. Epidemics of typhoid, diphtheria, scarlet fever, and streptococcus sore throat may be started by healthy carriers who work in dairies or food markets, or by handlers who have mild (ambulant) cases of the diseases mentioned. Typhoid germs may be carried into under ground water veins from infected fecal matter which has been thrown into outdoor toilets. Persons associating with infected patients and carrying germs upon the hands may infect themselves through carelessly putting the fingers into the mouth or handling food in eating. One public health bulletin sums up the sources of intestinal infections as "flies, fingers, food, and feces."

The Gastrointestinal Infections of Infancy.—In former years the intestinal infections of infancy were responsible for more infant deaths than any other one cause. With better food regulation, particularly regulation of milk production, fly control in towns and cities, more extensive use of refrigeration, and, especially, general education of mothers in infant feeding, there has been a marked reduction in illness and death from this cause.

Rosenau (1931) states that 90 per cent of infant deaths from diarrheal diseases are of bottle-fed children. He says this is not due to the artificial feeding per se, as the mortality rate among children given scientific artificial feeding is very low. It is because milk is so very susceptible to contamination and because the artificial feeding must be managed with the greatest precision and intelligence in order to make it safe.

Every artificially fed infant should be under the observation of a feeding specialist in a clinic or in his office, and every mother should feed her children at all ages according to modern standards. Especially must all milk and other foods be clean, fresh, and entirely free from bacterial contamination.

Bacillary dysentery is caused by the Bacillus dysenteriae, of which there are several varieties. Young children are most susceptible, although it may occur at any age. It is conveyed by food which has become contaminated through contact with the bacilli. Human carriers, flies, and dirty food containers may be responsible. Milk is the most frequent source, especially with very young children. The dysentery germs may remain alive for several days in the digestive tract of the fly. The germs attack the mucous lining and lymph structures of the colon (large bowel).

Symptoms.—The period of incubation is from 2 to 7 days, after which griping pains in the abdomen occur with copious, watery stools. The stools may consist of bloody mucus. The body is drained of fluid, extreme weakness and emaciation occur, and the patient may die of exhaustion.

Treatment and Nursing.—The treatment is strictly medical and is largely directed toward protection of the body fluids by giving normal salt solution in the tissues, or, in severe cases, directly into veins and toward supporting the strength. Blood transfusion is used in some cases. Serum treatment is not yet certain or effective.

The nurse must give all the fluids the patient can take. The food must be bland and free from all cellulose or irritating factors and will be prescribed by the doctor. Care of the buttocks and the anal region is important. These parts should be bathed and covered with some sterile lubricant after every bowel movement. The feces should be sterilized (see page 189) before disposal, and asepsis of hands, utensils, bedding, and clothing rigidly observed.

Prevention consists in the strictest care as to cleanliness and refrigeration of food in the home, in rigorous public health inspection of milk, water, and food, and in medical examination of food handlers (see page 165).

Typhoid Fever.—Typhoid is caused by the Bacillus typhosus, a germ which lives for some time in moist organic matter such as

food or fecal matter. It perishes when dried, but may survive months of freezing.[1]

Typhoid is found all over the world. While persons of all ages may take it, it is essentially a disease of adolescence and young adult life. It may occur in scattering cases or in local epidemics. The germ selects as its habitat the small glandular areas known as "Peyer's patches" (Fig. 74) which are scattered throughout the lining of the intestine (see page 108) The bacilli finally get into the blood stream and set up a characteristic toxemia with enlargement of the spleen, fever, etc.

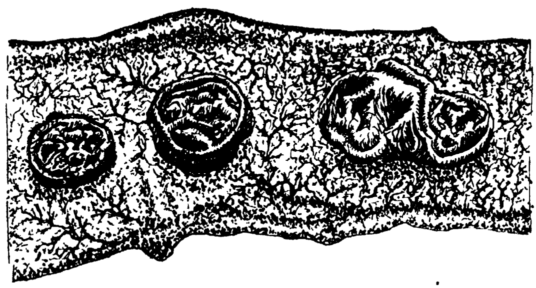


FIG. 74 --A section of the small intestine in typhoid fever showing congestion and ulceration of Peyer's patches. (Enlarged.) (*From Aikin, Home Nurse's Hand-book, W. B. Saunders Co.*)

Typhoid is a disease associated with insanitary conditions. The curve of deaths from typhoid might be used as a curve or index of the progress of sanitary science.[2] So closely is the spread of typhoid linked with modern standards of personal and community cleanliness and sanitation that it is now considered almost a disgrace to have an epidemic occur in a community.

Symptoms.—The stage of incubation is rather long, 9 to 14 or 18 days. The prodrome is characterized by a feeling of general illness, loss of appetite, bad breath, sometimes constipation, more often diarrhea. There may be chilliness, aching, and tenderness in the abdomen. The fever begins as a slight elevation, each day

[1] *Typhoid Fever: Its Causation and Prevention,* Public Health Bulletin No. 69, U. S. Public Health Service.

"Typhoid Fever and Water Supply," *Health Bulletin for Teachers,* Metropolitan Life Insurance Company, December, 1935.

[2] ROSENAU, MILTON J., *Preventive Medicine and Hygiene,* Fig. 7, p. 103, D. Appleton-Century Company, Inc., 1931.

reaching a higher peak. This continues for 10 or 12 days, when it reaches its highest level, continuing high for a week or 10 days. Each afternoon or evening the temperature falls somewhat, producing the characteristic picket-fence appearance of the temperature curve. At the end of about 3 weeks from the onset the temperature begins to drop, returning to normal or below in another week or 10 days (Fig. 75). "Rose spots" appear upon the abdomen during the second week of the disease. The blood shows bacilli during the first week and will agglutinate typhoid cultures (the "Widal test") (see page 185) during the second

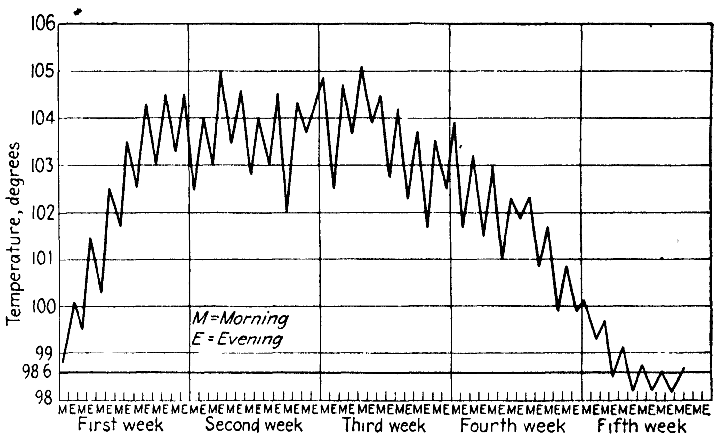


FIG. 75.—Diagram of a characteristic fever curve in typhoid.

week. The ulcerated intestinal glands sometimes bleed, causing tarlike hemorrhage with the feces. Sometimes the bowel becomes distended with gas, and ulcerations may rupture or "perforate." This is accompanied with shock and collapse, and is very serious.

In severe cases the patient is stupid and indifferent to what is going on. There may be either low muttering delirium or the maniacal type, in which patients may run away or jump from windows.

Complications.—Pneumonia, Bright's disease, and "white swelling" (phlebitis) of one or both of the lower limbs from blood clots in the veins may occur. Septic abscesses and bedsores may result from lowered resistance of the tissues.

Medical and Nursing Care.—There is no specific medical treatment, but close observation of symptoms with appropriate treatment as they arise is important.

In no disease is good nursing more essential than in typhoid fever. A generous but bland and nonirritating diet is prescribed and must be carried out over a period of 5 to 7 weeks. This is a very exacting task, requiring intelligence as to food values and resourcefulness in preparation and selection. The bathing, rubbing, and care of the body are important because of the debilitation of the tissues.

The teeth and mouth must be cleaned very often and very thoroughly on account of the accumulation of offensive secretions on tongue and teeth. A mouth wash of water with glycerine and lemon juice added is agreeable and inexpensive.

The sterilization of feces, urine, bedpan, and urinal is a never-ending responsibility (see page 189).

Prevention.—First of all, communities and homes should maintain high sanitary standards. Water and milk supplies should be rigidly inspected and controlled. Flies and other pests should be exterminated and excluded from contact with food.

Secondly, all food handlers, especially dairymen and cooks, should be medically examined and tested to discover typhoid carriers. Typhoid carriers are persons who continue to have live bacilli in the bowel, gall bladder, or urinary bladder after recovery from the disease. It is very difficult to sterilize typhoid carriers, and they are likely to communicate the disease to others over long periods of time. "Typhoid Mary" is a celebrated case. She was a domestic in New York who worked as a cook in 5 families within 5 years and infected 26 persons during that time.

In a California town a woman carrier prepared a large pan of baked macaroni for a church supper. Ninety-three persons eating of this dish developed typhoid of a virulent type, and there were several deaths. Investigation showed that the baking had incubated the germs in the center of the pan, causing them to multiply enormously.

Persons known to be carriers should be under medical supervision and control and should not be permitted to have any contact with the food of others. They should be required to disinfect all bowel and bladder discharges.

Thirdly, all persons should be immunized by typhoid vaccination (see page 187). This immunity is certain while it lasts, which is at least for two to three years. (One attack of the disease confers permanent immunity in most instances.) It is wise for all persons, particularly adolescents and young adults, to be vaccinated whenever they are going for a vacation or into situations where they do not know that the water supply is safe. Using only boiled water and pasteurized milk when in doubt is a further safeguard.

An indication of the effectiveness of this program of prevention is the fact that 24 major cities reported no typhoid during 1935.[1]

No terminal disinfection is required if proper care has been observed throughout the disease. The feces should be cultured sometime following recovery to determine whether the person remains a carrier.

Food Poisoning.—Food may be rendered poisonous either by the presence of bacteria which multiply after entering the body (food infection) or by the presence of toxins which develop through bacterial action in the food before it is eaten (botulism toxin).

Food infection is due to a group of bacteria known variously as the Gärtner, enteritidis, or paratyphoid group. Some of the numerous varieties of these bacteria may be found in the meat of an animal which was infected before being killed for food, or they may be conveyed to food after it is prepared for use. Foods, particularly meats (although milk products, grain, etc., are susceptible) which have been handled, chopped, or prepared for the table (without heating) some hours before serving are particularly likely to cause trouble. This accounts for the frequency with which one hears of the attendants of picnics or church suppers being poisoned from eating chicken salad, sandwiches, ice cream, etc. The food is not necessarily "tainted," and it is characteristic that foods so infected have no alteration in taste, odor, or appearance.

THE SYMPTOMS may come on within 12 to 72 hours after eating infected food, depending upon the type of infection and other vague individual factors. The severity also varies from mild nausea and diarrhea lasting only a few hours to such extremely

[1] *Science News Letter*, June 13, 1936.

malignant toxemias that many victims die. All cases are characterized by vomiting, diarrhea, pain, and prostration. In some instances everyone eating the infected dish is taken violently ill. This was formerly called ptomaine poisoning. Ptomaine saprophytes, however, attack only food which is in such an advanced state of decay it could not conceivably be eaten.

TREATMENT consists in speedy removal of all infected food from the digestive tract, with saline flushing of the stomach through drinking quantities of normal salt solution, and taking repeated small doses of saline laxative and copious enemas. Medical help should be obtained with all speed.

Food toxin is the term applied to the toxin produced by the Clostridium botulinum or Bacillus botulinus, a saprophyte found in food which has only started to disintegrate and in which no change in taste or odor can be detected by the human senses.

Botulism germs are harmless in themselves but produce a toxin which is exceedingly deadly. The germs grow in the absence of light and air (are anaerobic) and in the presence of food, warmth, and moisture. These conditions are found in canned food which has not been thoroughly heated in processing. The spores of botulism are widely distributed in dust, in soil, on vegetation, etc. When these spores find themselves away from light and air and in the presence of moisture, nutriment in the form of dead organic matter, and warmth as in canning, they become active and multiply rapidly, releasing the toxin which produces the characteristic symptoms in the human being consuming the food.

THE SYMPTOMS may appear within a few hours or several days. Unlike the Gärtner Bacillus, botulinus does not produce irritation of the digestive tract or pain. It attacks the nervous system, producing inactivity or actual paralysis of the abdominal and intestinal muscles with obstinate constipation and suppression of urine. This paralysis extends upward until the muscles of breathing and swallowing are affected, and the victim dies from failure of respiration. The vision is affected early. In advanced cases the individual struggles for breath, cannot remove secretions from the throat and larynx on account of the paralysis, and "drowns in his own secretions."

EARLY TREATMENT of botulism is similar to that for enteritidis poisoning.

PREVENTION of both enteritidis and botulism consists in thorough heating of all processed organic food (especially if it has been handled or exposed) immediately before eating. The importance of thorough heating is now so well understood by manufacturers that poisoning from commercial foods is practically unknown. Home canning and processing are not always so thorough, and all foods prepared at home should be thoroughly heated before serving. The preparation of food in quantities should be done under the supervision of a trained person who will recognize sanitary faults in the technic.

Tularemia is a disease primarily of wild rodents: rabbits, opossums, woodchucks, ground squirrels, etc. It is communicated to man through contact with infected wild animals, especially in the preparation of rabbits used for food. It may be conveyed by flies, ticks, lice, fleas, etc., which have bitten infected animals. It was first described in 1911. Laboratory workers doing experimental work in tularemia with animals may contract the disease.

Cause and *Symptoms.*—The cause is the Bacterium tularense discovered in 1912. The period of incubation is 2 to 5 days. The symptoms are headache, chills, body pains, vomiting, and fever. The site of infection ulcerates, and the neighboring lymph nodes may enlarge and ulcerate. The fever goes up and down for several weeks, and convalescence is very slow. The individual may remain weak and out of health for months or even several years. The blood of a tularense patient agglutinates bacterial cultures from the second week until complete recovery.

Treatment.—No serum has been perfected for treatment or immunization. One attack seems to confer lasting immunity. Prolonged rest in bed and treatment of symptoms seem to be the only applicable measures.

Prevention lies in thorough cooking of all wild meat and in scrupulous disinfection of the hands or wearing rubber gloves while dressing or handling wild game.

Intestinal Parasites.—Tapeworm, roundworm, and seatworm or threadworm[1] are intestinal parasites which gain entrance to the body through food or water infested with eggs or larvae acquired

[1] CHANDLER, ASA C., "Messmates in the Human Body," *Hygeia*, August, 1923.

through contamination with infected fecal matter by way of dust, fingers, or other objects. The larvae of tapeworm may burrow into the flesh of hogs or cattle and be conveyed to a human being who eats imperfectly cooked meat.

The eggs of all intestinal parasites leave the body in the fecal discharges; hence the occurrence of infection is chiefly limited to premises or localities where outdoor toilets are used. These diseases are practically unknown in towns and cities and in families having approved disposal of sewage and proper outdoor toilets.

The tapeworm attaches itself to the intestinal wall by means of hooks or suckers on its head segment. It grows by means of segments, each segment being virtually a new animal with sex organs and capable of producing prodigious numbers of eggs. The tapeworm may grow to enormous length—even 30 feet or more. It absorbs nutriment from the intestinal food mass and robs its host of considerable food. Voracious appetite is one of the symptoms of tapeworm infection.

Roundworms resemble fishworms in size and color and may be 3 to 6 inches long. In case of ingestion of many eggs together with constipation or sluggishness of the bowels, there may be great numbers of these in the bowel.

The seatworms (*"threadworms"*) are very small, appearing to the naked eye like minute filaments of thread. They tend to collect in the lower bowel and produce intense itching of the rectum and anal region. Antiseptic enemas containing quassia bark extract may be tried in addition to medical treatment.

The symptoms of "worms" in children (usually roundworm) are vague, consisting of loss of appetite, nausea, sometimes pain in the abdomen. The traditional symptoms of "a white ring around the mouth," "pinched nostrils," and "grinding the teeth" are entirely untrustworthy. The presence of worms in the stool is the only certain evidence.

Treatment for all these parasites consists in thorough cleansing of the bowel with a saline laxative followed by santonin or oil of chenopodium *as prescribed by a physician.* The practice of buying "worm medicine" at the drugstore and giving it to children "on suspicion" cannot be too strongly condemned, for the drugs used are very powerful and irritating, and may easily cause

permanent injury to the mechanism of the bowel. There is a possibility that the antiseptic hexylresorcinol may replace the older, drastic remedies. (See p. 366.)

Prevention.—Worms seldom, if ever, develop in the intestines of a child or adult who eats a balanced ration with the approved proportions of vitamins, minerals, and cellulose, and who keeps the body in a vigorous, normal condition.

References

CHANDLER, ASA C.: "Messmates in the Human Body," *Hygeia*, August, 1923.

GEIGER and GREY: "Food Poisoning—A Public Health Problem," *American Journal of Public Health*, October, 1933.

"Hexylresorcinol as a Vermifuge," Editorial, *Journal American Medical Association*, Nov. 22, 1930.

KILLDUFF, ROBERT A.: "Food Poisoning," *Hygeia*, September, 1934.

Science News Letter, June 13, 1936.

"Typhoid Fever and Water Supply," *Health Bulletin for Teachers*, Metropolitan Life Insurance Company, December, 1935. *Typhoid Fever: Its Causation and Prevention*, Public Health Bulletin 69, U. S. Public Health Service.

CHAPTER XXIV

THE VENEREAL DISEASES

The venereal diseases, syphilis and gonorrhea, are usually acquired through sexual intercourse with infected persons, although they may be communicated through drinking after or kissing persons afflicted with syphilitic chancre of the lip (Fig. 76) or with syphilitic sore throat, or from contact with fresh gonorrheal secretions on toilet seats. Fortunately the germs of both diseases die immediately on exposure to light and air, and can be acquired only through contact with moist secretions. Girl children are rather easily infected from toilet seats or other chance contact of the genitals with fresh gonorrheal secretions. Surgeons have been known to infect themselves through accidental puncture of the skin of the hand in operating upon infected organs or tissues.

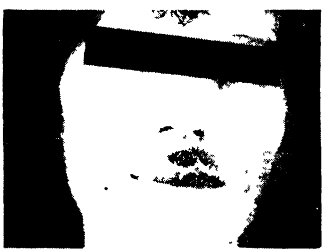


FIG. 76 Chancre, upper lip Inoculation by kissing. (*Courtesy of United States Public Health Service.*)

There is no essential connection between venereal diseases and the reproductive organs; it is purely accidental that these germs find conditions favorable in the urethra of the male and in the external genitals and vagina of the female. Both species of germs thrive best in the absence of light and air and in the warmth, moisture, and particular chemical situation found in these tracts. The throat and eye also offer favorable conditions, and may be the places of entrance for the germs. Sexual intercourse provides the means of direct transmission without exposing the germs to light or air.

Because prostitution plays a role directly or indirectly in most cases, and because all matters associated with sex and the sex organs have been so strictly taboo, these infections have never

been treated or controlled as have other infectious diseases. A conspiracy of secrecy exists even today, although the World War did a great deal to change the public attitude. The discovery that venereal disease was making an appalling number of young men unfit for military service led to frank discussion and energetic medical and official action.

At the time of the war most states of the union established institutions for the treatment of these diseases, and laws were passed authorizing the forcible "internment" until cured of all diseased persons coming to the attention of the police or other public authorities. Latterly many of the free public clinics for the treatment of venereal disease have been closed and internment for compulsory treatment has largely ceased.

All contagious diseases are required by state laws to be reported immediately by the attending physician to the State Boards of Health (Divisions of Epidemiology). In most states venereal diseases are reported by code number only, the physician keeping a key whereby he can, if necessary, identify his records.

On account of the "conspiracy of secrecy" it is impossible to know how many active cases there are in the general population at any given time. In 1933, in the section on dermatology and syphilology of the American Medical Association, resolutions were passed calling attention to the importance of discovery and treatment of syphilis in pregnancy. It was estimated that from 8 to 10 per cent of women coming to prenatal clinics have positive Wassermann reactions, and that approximately 2 per cent of all children born in the United States have some form of congenital syphilis.

J. Whitridge Williams, late instructor in obstetrics at Johns Hopkins University Hospital and Medical School, made a study in 1920 of the records of 4,547 pregnant women. He discovered that, among the syphilitic, with those who were given no treatment 52 per cent of the children were born syphilitic; partial treatment reduced this to 37 per cent; while cases of complete treatment showed only 7.5 per cent of infections in the infants. Complete treatment before the third month of pregnancy reduces the danger for the infant almost to zero.

Rosenau says the number of new cases of venereal disease in the general population each year "probably exceeds that of all the

other notifiable diseases combined."[1] The health officer of New York City estimated in 1912 that one-fifth of the population of the city was afflicted with some form of venereal disease. Vedder estimates that 8 per cent of the population of the United States at large is infected with syphilis, distributed as follows: 50 to 100 per cent of prostitutes; tuberculous patients in institutions, 20 to 30 per cent; sick children in hospitals, 2 to 10 per cent; mentally backward and idiots, 20 to 40 per cent; criminals, 20 to 40 per cent; presumably healthy men of the class that enlists in the army, 20 per cent; men of better families, 2 to 10 per cent. Dr. Parran, of the U. S. Public Health Service, estimates that syphilis attacks and disables more than half a million persons in the United States each year.[2]

It is commonly stated that gonorrhea is the most constantly prevalent of all serious contagious diseases except measles and probably is four times as prevalent as syphilis. While these figures are estimates, based upon scattering statistical studies, there is reason to believe that these diseases are much more prevalent and much more serious than is generally recognized. Intelligent citizens should support all public health efforts to suppress the venereal diseases, and especially all educational measures which will prevent adolescents and young men and women from becoming innocent victims.

Syphilis is caused by the Treponema pallidum or Spirochaeta pallida (literally the "pale spiral") (Fig. 68, 8), a very minute corkscrewlike germ which is very resistant to laboratory stains and is usually studied by dark field illumination, whereupon the spirochete appears as a white or colorless spiral against a dark background. It is apparently a transition form between bacteria and protozoa (see page 178).

While syphilis is not so virulently contagious as gonorrhea it tends to become chronic, is very persistent, and produces much more serious consequences. Osler declared that of the killing diseases, syphilis comes third or fourth. Rosenau says syphilis

[1] Rosenau, M. J., *Preventive Medicine and Hygiene*, p. 50, D. Appleton-Century Company, Inc., 1931.

[2] Parran, Thomas, "The Next Great Plague to Go," *Survey Graphic*, July, 1936.

causes 10 to 35 per cent of all insanity, and is one of the causes of mentally and physically defective children. It is the cause of locomotor ataxia, paresis [softening of the brain], and is the chief cause of apoplectic strokes in early life, and is responsible for a large proportion of diseases of the heart and blood vessels; it is the cause of nearly one-half of abortions and miscarriages. Syphilis decreases the length of life about one-third. . . . It is the most serious cause of disruption of home and happiness.[1]

The germs of syphilis penetrate practically all organs and tissues of the body, producing pathological change in the most susceptible tissue in the particular individual. Syphilis germs even penetrate the placental capillary membrane, and an infant may be born with active infection.

Symptoms.—Syphilis shows four stages or phases, not all of which may be clearly defined in every case. In the primary stage the spirochetes when deposited upon susceptible mucous membrane, such as the genitals or lips, penetrate to nearby lymph nodes, which become swollen, hard, and painful, and within 10 days to 3 weeks the site of infection breaks down into sluggish ulcers or sores known as *chancres.* The secondary stage usually appears about 6 weeks after the chancre and may be so mild as to escape notice, or it may last for weeks, months, or years. Any or all of the following symptoms may appear: eruptions upon skin or mucous membrane, fever, anemia, headache, pain in joints, sore throat, enlarged lymph nodes, and falling hair. The tertiary stage appears several years later and is produced by *gumma* formation (granules of encapsulated germs comparable to the tubercles of tuberculosis) in one or many organs and tissues, producing varied symptoms according to location and extent. Skin lesions and arthritis may occur. The fourth stage may appear years later still and is marked by degenerative action in the brain and nervous system, the heart, and the blood vessels. Dementia, paralysis, arteriosclerosis, fatal disease of the heart, locomotor ataxia, etc., may occur, leading eventually to death.

Treatment.—Modern diagnosis is based upon the presence of a positive Wassermann reaction (complement fixation test with syphilitic antigen) together with positive clinical symptoms as

[1] Rosenau, *op. cit.*, p. 63.

described above, and, if possible, bacteriological examination of secretions. The Wassermann reaction may be absent during the incubation period and during treatment, and Wassermann-like reactions occur in other conditions; hence it alone is not considered to be conclusive evidence of the disease, although a strongly positive reaction is seldom in error. Treatment consists of the use of highly specialized preparations of bismuth, mercury and arsenic (salvarsan, arsphenamine, and others). Treatment must be persistently followed for long periods of time. Until pronounced cured by a competent specialist it is a moral crime for an infected person to marry or produce children.

Prevention consists chiefly in such positive education of the young that they may avoid the possibility of infection. There seems to be no immunity, either natural or acquired. Repeated infections are possible. Innocent infection may be avoided by taking care not to touch objects or surfaces which may have live germs upon them and by avoiding intimate physical contact with infected persons.

Gonorrhea is caused by a large, semispherical or biscuit-shaped coccus known as the Diplococcus of Neisser (Fig. 68, 5). It is highly contagious but easily killed by weak antiseptics, drying, or exposure to air. It affects all ages and classes of society. Rosenau says it is responsible for 6,000 to 10,000 cases of blindness in the United States; it is the cause of 60 per cent of blindness in the newborn and more than 10 per cent of all blindness. It is the cause of 60 to 75 per cent of all operations upon the female reproductive organs, of 50 per cent of sterility, and of many chronic diseases of the joints, bladder, and generative organs.[1]

Gonorrhea is not hereditary, but infants in passing through the birth canal are very likely to have gonorrheal germs conveyed to the eyes if such germs are present in the vaginal tract. The resulting infection is known as *gonorrheal ophthalmia neonatorum.* Unless treated at once with a prophylactic (usually 1 per cent silver nitrate, or sylvol or argyrol) the child will be fairly certain to develop "sore eyes of the newborn" within 36 to 72 hours, and unless promptly and correctly treated will certainly lose its eyesight (Fig. 77).

[1] *Ibid.*, p. 67.

Symptoms.—The period of incubation is shorter than for syphilis, being only 3 to 10 days after exposure. The infected mucous membrane of the eye, urethra, or vagina becomes inflamed and discharges copious amounts of highly infective pus. The inflammation tends to travel along the passages and tubes of the reproductive organs, causing painful and often serious stricture of the male urinary passage and spermatic duct, and abscesses in the Fallopian tubes (oviducts) of the female. It is these abscesses which frequently must be surgically drained. The scar tissue remaining in the tubes, male or female, may entirely close them to the passage of sperm and ova, thus causing permanent sterility.

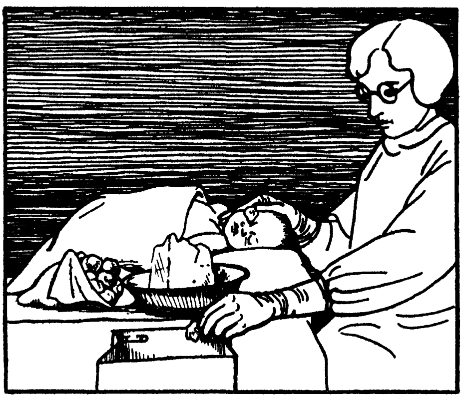


Fig. 77.—Applying cold compresses to the infected eyes of an infant. (*Modified from DeLee, Obstetrics for Nurses, W. B. Saunders Company.*)

While the syphilis toxin frequently causes the death of the fetus and is called "the slayer of the unborn," gonorrhea is called "the great sterilizer."

The diplococcus may get into the blood stream and cause acute infection of the lining of the heart (gonorrheal endocarditis) with serious and usually fatal results. It also attacks the serous lining of joints (gonorrheal arthritis), usually one at a time.

Young female children are highly susceptible to gonorrheal infection of the labia and vagina, acquiring it very easily from infected toilet seats, bathtubs, etc. Epidemics of gonorrheal vulvovaginitis sometimes occur in children's institutions. Girl children should be watched with special care in regard to opportunities for contact contagion of the genitals.

Treatment is both local and medical and must be continued over a long period of time. The acute symptoms tend to run their course, and the individual may think himself or herself cured. Germs may remain alive, however, in glands or tissues, and may be conveyed to another person in sexual intercourse or by contact. Gonorrheal germs are especially likely to remain alive for a long time in the prostate gland of the male.

Patent remedies should never be used. The much advertised "sure cures" are dangerous and entirely uncertain and unreliable. The advertising and dispensing of such preparations should be prohibited by law. The very best medical advice only should be sought, and the individual must cooperate fully and continue treatment until it seems certain that no hidden foci of infection remain.

References

HARRAN and USILTON: "The Extent of the Problem of Gonorrhea and Syphilis in the U. S.," *Journal of Social Hygiene*, January, 1930.

Pamphlets on Venereal Disease, Publications of the American Social Hygiene Association, 50 W. 50th Street, New York.

Pamphlets on Venereal Diseases, Publications of the U. S. Public Health Service, Washington, D. C.

Pamphlets on Venereal Diseases, Publications of State Boards of Health.

PARRAN, THOMAS: "The Next Great Plague to Go," *Survey Graphic*, July, 1936.

ROSENAU, MILTON J.: *Preventive Medicine and Hygiene*, D. Appleton-Century Company, Inc., 1931.

SCHAMBERG and WRIGHT: *Congenital Syphilis*, *Veneral Disease Information*, Oct. 20, 1929, U. S. Public Health Service, Washington, D. C.

SHAW and WILE: "The Prevention of Syphilis with Special Reference to Early Syphilis in the Mother," *Journal of the American Medical Association*, Dec. 13, 1930.

SOLOMON and SOLOMON: *Syphilis of the Innocent*, U. S. Interdepartmental Social Hygiene Board, 1922.

CHAPTER XXV

MISCELLANEOUS AILMENTS

Cancer is another scourge of human kind comparable to tuberculosis and syphilis for the reason that it may attack any organ or tissue in any race or sex and, as with tuberculosis, there is no known specific cure. Cancer is essentially a disease of middle and old age, occurring rarely under forty. The predisposing causes, however, usually date back to earlier years.

Cause.—Cancer is known to be a phenomenon of cell growth and is *not* due to an infective germ. It is now believed that *susceptibility* to cancer is inherited as a recessive Mendelian trait. This susceptibility, moreover, appears to hold for specific tissues only; there may be, for example, susceptibility to gland cancer, skin cancer, or bone cancer.[1]

When cancer occurs certain apparently normal cells begin to multiply enormously, breaking loose, so to speak, from the communal control of the body. When these wild cells become active there is no known way to stop their rapid growth except with radium or X-rays. They cause the disintegration of adjacent tissue and progressively destroy the organ or part involved, releasing in the process toxins which produce characteristic body changes such as a greenish pallor and extreme loss of weight and strength. The cancer cells tend to migrate in the blood stream from the original focus and set up active foci in other parts and organs (metastasis). *This is the reason the first spot of activity should be removed as soon as recognized* in order to forestall or prevent the spread.

The predisposing cause of cancer always is tissue injury. Any long-continued slight injury or irritation to susceptible tissue may produce certain obscure changes in the tissue cells which eventually, when to these are added the also obscure biochemical changes of age, cause the cells to set up "malignant" action.

[1] Sly, Maud: *Proceedings of the Third Race Betterment Congress*, Race Betterment Foundation, 1928.

Treatment consists in the prompt surgical removal of all suspicious nodes or lumps before the really active process begins. This is practically 100 per cent effective. X-ray and radium are used with some success in inoperable cancer, and also to check recurrence after operation.

Prevention consists in guarding against continued tissue irritation. Neglected gastric ulcers predispose to cancer of the stomach; carrying a pipe or cigar in the corner of the mouth to cancer of the lip. Picking off scabs in chronic catarrh may cause cancer of the nose. Clothing may constantly rub a projecting mole or wart. Workers in irritating chemicals may acquire skin cancer. Childbearing women tend to have cancer of the breast and uterus. The prompt healing of all injuries and guarding against irritation furnish the best prevention.

Tumors.—Young women may have *fibroid or cystic tumors* of the uterus or ovaries, but seldom or never have cancer. Women from forty on are liable to cancer, and also sometimes develop fibroid tumors during the change of life. A fibroid tumor is a mass of dense fibrous tissue. A cyst is a connective tissue capsule which becomes filled with fluid and sometimes grows to enormous size. Neither of these is infectious or inflammatory, and neither injures the health unless it becomes large enough to press upon nerves, blood vessels, or adjacent organs.

The symptoms of tumors are: sense of pressure; increase in size of abdomen; sometimes irregular bleeding between menstrual periods or after the menopause; and sometimes pain caused by pressure upon surrounding nerves. *The treatment* is usually surgical removal. Since there is nothing infectious in those growths removal is safe and effective and should be done before adhesions occur or other organs are injured by pressure. Fibroids are sometimes treated by X-ray.

Focal Infections and Diseases Caused by Them.—A focal infection is a long-continued subacute or chronic local infection which does not seem serious in itself but which tends to produce secondary infections of serious character in other organs or tissues, sometimes very remote from the focus.

The focus may be very small, in the root canal of a "dead" tooth, in an abscess about the roots of a tooth, in the nasal sinuses, or in the crypts of the tonsils. The secondary infection

may occur in joints, in the covering or the lining of the heart or the valves of the heart, in the nerve sheaths or the kidneys. The diseases most frequently associated with infective foci are rheumatism (which is often associated with diseased heart, both often being due to tonsillar infection), anemia, neuritis, gastric disorders, some types of nephritis (inflammation of the kidneys), neuralgia, appendicitis, abscesses in various parts of the body, arthritis, etc. Infection in a focus may so invade adjacent tissue that even surgical removal of the focus is not effective.[1]

It is highly important that all "foci" should be discovered and treated or removed. Diseased tonsils and teeth are nothing but a menace and should be removed as soon as discovered. Infected sinuses and glands should be thoroughly treated.

Malarial fever is caused by an animal parasite, the protozoön Haemosporidia Plasmodium (see protozoa, page 176). This plasmodium lives one cycle of its life in the malarial mosquito, *Anopheles*, and is transmitted through the bite of infected Anopheles. The Anopheles breeds in stagnant or slowly running water; hence the prevalence of malaria in swampy and newly settled regions. With the drainage and cultivation of the land and the obliteration of swamps malaria disappears. Existing breeding places can be rendered harmless by spraying the still water with crude oil or stocking it with mosquito-devouring fish. Rain barrels, lily pools, cans in junk piles exposed to rain—stagnant water in any situation—may breed mosquitoes of many varieties, including the malarial mosquito. These facts are now so well known and public health organization is becoming so increasingly efficient that malaria in the United States is a rapidly disappearing disease.

The symptoms are: chill, fever, sweating in clocklike repetition, every second, third, or fourth day, according to the type of protozoön involved (Fig. 78). The stages are sometimes called "the cold, the hot, and the wet." The temperature may rise during the chill; the patient suffers from headache and prostration.

The germs breed in the red blood cells; hence in prolonged cases there is a peculiar and progressive anemia. Since the spleen and

[1] MEYER, SOLIS-COHEN, "Revising the Common Concept of Focal Infection," *Journal of the American Medical Association*, Apr. 7, 1934.

liver dispose of dead red blood cells both spleen and liver enlarge with the increased work.

Treatment.—Quinine is the specific for malaria.

Prevention lies in exterminating the malarial mosquito.

Nephritis, "Bright's disease" is the name given to a group of diseases in which there is impairment of the structure or function of the kidney. Nephritis may occur at any age from infancy on; it is, however, essentially a disease of middle age. Nephritis is among the three or four leading causes of deaths in all statistical reports. (Cancer, heart disease, and pneumonia share the honors among the middle-aged.)

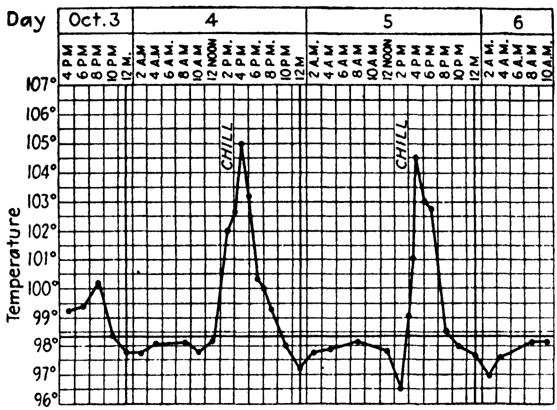


Fig. 78.—Two-days temperature curve in malaria. (*From Osler, Principles and Practice of Medicine, D. Appleton-Century Company, Inc.*)

Nephritis may be acute, caused by the germs or the germ toxins of any serious infective disease. Scarlet fever and other streptococcic infections are especially likely to affect the kidneys.

Subacute and chronic forms of nephritis occur in which the cause seems to be a general systemic impairment of chemical balance, affecting not only the kidneys but the heart and various other organs and functions of the body. Indeed, nephritis is now considered to be a disease of the whole body resulting in degeneration of kidney structure, and not, as formerly, a specific disease of the kidneys alone.

Certain types of nephritis are accompanied by salt retention in the tissues with disturbance of osmotic balance between tissues

and blood, producing dropsy. The dropsy may be relieved by reducing or eliminating salt in the diet (see page 81).

Certain types seem to be the result of general arteriosclerosis, producing contraction and degeneration of the kidney structures and preceded and accompanied by high blood pressure. Carbohydrate metabolism may be disturbed, leading to acidosis and dropsy. The retention of nitrogen (protein) in the blood and urine is a specific and early diagnostic symptom. This led at one time to the natural conclusion that protein metabolism was primarily concerned in the disease process. It is now believed that this too is a symptom rather than a cause.

Causes.—The causes of nephritis are obscure at present. The disease certainly involves many chemical reactions in the closely integrated highly complex living chemical machine in which we live.

Some authorities believe that there is frequently a hereditary predisposition, since a number of cases may appear in a family group. Given a susceptibility or a low margin of safety, any unusual strain or irritation may produce the condition. Some of the possible sources of strain or irritation are alcohol, absorption of turpentine from working with paints or turpentine products, toxins and acute infections, excess of purine-rich meats or other proteins, the use of irritant drugs or stimulants. It is even suggested that sensitization to certain foods habitually used in the diet may be a factor. Foci of infection in teeth, sinuses, or tonsils may cause certain types of nephritis.

Treatment is entirely a matter of expert medical advice, since the symptoms vary and require varied handling. Especially should no one use patent medicines or remedies suggested by lay advisers. There is a rather strong reaction on the part of the medical profession, just now, against the use of drastic diuretics (drugs irritating and stimulating the kidneys and thus forcing an increased flow of urine). The use of diuretics was formerly favored in medical treatment, and most patent "kidney medicines" contain diuretics (see page 349). Their improper use may seriously injure the weakened kidney structures.

Prevention consists in carefully fostering chemical balance in the body through balanced diet and good general hygiene. Especially should imprudence in youth in the way of using alcohol or

excess of sweets or meats, or any other "chemical insult" to the body, be avoided, as constant slight irritation may predispose to the breakdown of the metabolic machinery in middle age. Especially, again, should adults such as business or professional men and women observe a balanced program in diet and exercise. The degenerative diseases of middle age (including diabetes, nephritis, and heart disease) are especially likely to occur in the numerous class of men and women who follow intensive intellectual occupations, indulge in moderate but constant chemical stimulation, and pay insufficient attention to food, exercise, and sleep.

It is important to avoid infections by keeping a high degree of natural immunity and by using approved immunizing bacterial serums. Following up attacks of acute infections with urinalyses is important, also eliminating foci of infection.

Anemia is the name given to a class of diseases characterized by deterioration of the blood through the decreased production or the increased destruction of blood constituents, or the mechanical loss of blood through hemorrhage.

Simple or secondary anemia follows or accompanies most chronic or prolonged conditions of ill-health, especially certain infections such as malaria, septic poisoning, syphilis, dysentery, and intestinal parasites. Cancer, nephritis, and chronic chemical poisoning, for example that from lead, produce destruction of blood elements. Prolonged slow internal hemorrhage from gastric ulcers, bleeding hemorrhoids, or menorrhagia (excessive menstrual bleeding) may produce marked anemia. Prolonged underfeeding, especially deficiency in the blood-forming minerals—calcium, phosphorus, iron, copper, and manganese—will produce marked anemia.

The symptoms of simple anemia are pallor of the mucous membranes of the mouth and eye, and general loss of strength and energy, with many secondary effects due to general lowered function of the digestive organs and other vital organs. There is susceptibility to infections and metabolic disease, in short a general lowering of efficiency and resistance.

Laboratory examination of the blood will usually show a reduced number of red cells, which normally number 4,500,000 to 5,000,000 per cubic millimeter, with a corresponding fading of red color due to reduction in the hemoglobin, the oxygen carrier in the

red cells. In certain less common types there may be a greater relative reduction in hemoglobin or coloring matter than there is in number of cells, showing that it is the quality rather than the number present which is at fault.

Treatment consists, first of all, in identifying and correcting the cause; secondly, in supplying the body with an abundance of blood-forming foods; and, of course, any necessary correction of the general personal hygiene and any special medical treatment indicated in the particular case.

Diet is the all-important factor in treatment of any form of anemia. First, a general balanced diet should be adopted, then there should be emphasis upon the addition of blood-forming factors, particularly liver. McLester[1] says the diet should be selected from easily digestible food because of the impaired vitality of the digestive organs. He also advises that the foods of lowest potency in blood formation, such as cereals, be used for the time being in small quantities, and that liver, kidney, and fowl gizzards (kidney and gizzard seem to be as potent as liver) be used daily until the hemoglobin index returns to normal.

Pernicious Anemia.—While pernicious anemia affects the composition of the blood and is accompanied by selective destruction of certain classes of blood cells, it is now believed to be actually a disease of the stomach. It seems, from recent research, that the stomach produces an essential factor, not yet isolated (other than hydrochloric acid and the specific digestive enzymes), which acts in some "intrinsic" way upon muscle proteins and produces an "antianemic" hormonelike substance (see page 132). This antianemic substance seems to be stored in the liver, kidneys, and spleen and in the gizzard of fowls, possibly in the reticulo-endothelial mechanism (see page 184). Lack or "deficiency" of this substance produces pernicious anemia, a disease which, when untreated, tends to pursue a fatal course.

Treatment is the same as for simple or secondary anemia except that in feeding a higher concentration of the antianemic factor is necessary. Extracts of this factor in combination with iron and other blood-forming minerals and pigments are now used successfully, making it no longer necessary to eat enormous amounts of liver. As yet no way is known of restoring the antianemic glands

[1] McLester, James S.: *Nutrition and Diet in Health and Disease*, pp. 716–717, W. B. Saunders Company, 1931.

to action and the person having pernicious anemia, like the diabetic patient and the cretin child, must continue to take the protective factor as long as he lives.

The symptoms of pernicious anemia, other than the blood changes, are varied and should have specific medical attention as they occur. Absence of gastric acid and spinal-cord paralyses is usually noted in some degree and is almost a specific symptom.

Prevention consists in pursuing a "balanced" mode of life, especially with reference to a diet containing a full amount of vitamins and minerals.

Skin Infections.—*Impetigo* appears as pustules upon the face, neck, and hands with dirty yellowish or brownish scabs. The pustules, if scratched, may run together, covering a considerable area. The disease is highly contagious and is conveyed from child to child in schools or institutions by means of fingers infected from scratching, by towels, lavatories, etc.

TREATMENT consists in thorough cleansing and softening of the crust with soapsuds and cotton, followed by painting with tincture of iodine and covering with an ointment or salve to keep the tissues soft. No child with impetigo should go to school or mingle with other children, and he should use only his own towels, wash cloth, wash basin, and soap.

Favus or *ringworm* is the name given to a variety of related eruptions caused by fungus growths (plant parasites distantly related to mold on bread). Ringworm may attack the scalp, causing the hair to drop out temporarily or permanently. It may occur on any exposed place on the skin, where it tends to spread in a more or less circular fashion with healed spots in the center, hence the ringlike appearance which gives the disease its name.

"ATHLETE'S FOOT" is a very chronic, resistant type of favus which occurs on the feet and between the toes. It is prevalent where numbers of persons walk upon wet surfaces in bare feet, as in showers and locker rooms of gymnasiums and swimming pools.

Ringworm or fungus infections penetrate deeply into the skin and are often difficult to cure. The fresh eruption consists of minute "water blisters" which itch intensely, break, and dry, forming crustlike coverings.

TREATMENT for the ordinary skin eruption is the same as for impetigo. Athlete's foot is being treated by soaking the feet in

solutions of sodium hypochlorite (see Dakin Solution, page 367) or sodium theosulphate. X-ray treatment is sometimes used.

PREVENTION consists of scrupulous policing of dressing rooms, shower baths and swimming pools. All floors should be disinfected daily and all persons entering pools should be required to walk through foot baths such as are now generally found sunken in swimming-pool floors, and said baths should be filled with chlorinated water or other disinfectant. Many gymnasiums require all students to wear individual wooden clogs or sandals, and no one is permitted to walk barefooted. Obvious cases should, of course, not be permitted the use of communal pools and equipment.

Acne ("pimples") is a distressing affliction to which adolescents are particularly liable. In some instances the primary cause is skin allergy (see page 194), and the remedy lies in consulting an allergy specialist. In other cases pus germs have invaded the sweat pores of the exposed parts of the face and set up deep-seated and obstinate infection. In this case building up the general health and resistance with the persistent use of mild antiseptics will often be successful. Occasionally autogenous vaccines are effective.

References

HOWELL, W. H.: *Textbook of Physiology*, W. B. Saunders Company, 1931.

LUSK, GRAHAM: *The Science of Nutrition*, W. B. Saunders Company, 1928.

McCOLLUM, E. V.: *The Newer Knowledge of Nutrition*, 5th ed., The Macmillan Company, 1932.

McLESTER, JAMES S.: *Nutrition and Diet, in Health and Disease*, W. B. Saunders Company, 1931.

MEYER, SOLIS-COHEN: "Revising the Common Concept of Focal Infection," *Journal of the American Medical Association*, Apr. 7, 1934.

ROSE, MARY SWARTZ: *Feeding the Family*, The Macmillan Company, 1929.

———: *The Foundation of Nutrition*, The Macmillan Company, 1933.

ROSENAU, MILTON J.: *Preventive Medicine and Hygiene*, D. Appleton-Century Company, Inc., 1931.

SHERMAN, H. C.: *Chemistry of Food and Nutrition*, The Macmillan Company, 1933.

———: *Food and Health*, The Macmillan Company, 1934.

SLY, MAUD: *Proceedings of the Third Race Betterment Congress*, Race Betterment Foundation, 1928.

The White House Conference Report, Vol. III, *Nutrition*. D. Appleton-Century Company, Inc., 1932.

New Terms in Chap. XXVI

Asthenic. Weak, ineffective; applied to slender body build.

Compulsion. Sometimes applied to compulsive ideas, such as stepping over all cracks, touching every wall as one passes, etc.

Delusions. Beliefs which do not have basis in fact.

Dementia precox ("dementia of the young"). A synonym for schizophrenia; a type of mental derangement which tends to appear in young adults.

Epilepsy. A nervous explosion in the cortex of the brain accompanied by loss of consciousness and convulsive movements. The immediate causes of epileptic symptoms are many, but the true nature of the disease is yet unknown.

Extrovert (or extravert) "turned outward" applies to a personality which is actively interested in things external to himself, aggressive.

Functional. Applies to conditions for which no organic cause has yet been found, although it is now generally believed that behavior is always organic in character.

Hallucinations. Sensory delusions; hearing sounds, seeing objects, etc., which do not exist objectively.

Hysteria. A condition in which there is a curious "uncoupling of the will," an inability to control one's behavior. The individual may laugh and cry uncontrollably; may show fake paralyses; pain; convulsions and symptoms of many diseases which, in fact, are not present. Hysteria is objective in that the symptoms are obvious to others.

Insanity. A term used in court procedure and in legal statutes to indicate a degree of mental derangement such that the individual may legally be deprived of his liberty in the interest of safety to himself and others.

Introvert (or intravert) "turned inward." Applies to a personality which sees everything in relation to himself, seclusive, sensitive.

Mania. Intense and irrational activity or excitability.

Manic-depressive psychosis. A mental disorder characterized by periods of great elation or excitement (mania) which may be followed by periods of great depression (melancholia), or it may be characteristically manic or melancholic throughout the duration of the condition.

Nervousness. A state of hyperexcitability of the cerebrospinal nervous system. There is no such thing as pure "nervousness" unrelated to some specific cause.

Neurasthenia. A condition of abnormal susceptibility to fatigue; is subjective in character in that the symptoms are apparent only to the subject himself.

Neurosis or psychoneurosis. A term applied to the less serious functional behavior disorders, such as hysteria, neurasthenia, phobias, anxieties, nervousness, obsessions, and compulsions.

Organic. Applies to conditions in which organic changes can be recognized.

Objective. Refers to phenomena which may be observed by others.

Phobia. Excessive fear, particularly as attached to some delusional idea, such as fear of crossing open spaces, fear of soiling the hands, etc.

Psychosis. A term which broadly includes all mental disorder but which is commonly applied only to the major behavior disorders for which, as yet, no organic basis has been discovered. This comprises manic-depressive, schizophrenic, and paranoiac disorders and others occurring less often.

Pyknic (thick). Applied to stocky body build. Opposed to asthenic.

Schizophrenia ("split mind"). A chronic mental disorder affecting the emotional field, in which the individual loses sense of reality in his attitude toward specific aspects of his life. He may be normal and even brilliant in all other mental operations.

Subjective. Refers to experience which is apparent only to the individual himself.

CHAPTER XXVI

MENTAL DEFICIENCY AND MENTAL DERANGEMENT

> We see that the mind is not matter in motion and not a function of the brain. It is the characteristic activity of a unitary complex of an exceedingly high order. It is not a function of any organ or set of organs within the body but an activity of the individual as a whole in interaction with his physical and social environment.[1]
>
> G. T. W. Patrick

Doctor Patrick's definition of mind is in keeping with the funda mental thesis of this text that the human being is a unified biochemical organism, integrated within himself as a body-mind and in turn integrated with his environment even to the mos ultimate concept of the universe. The psychologist is intereste in determining the normal or natural integration of the body mind with environment. The psychiatrist, also, starts with th normal and goes on to study deviations from the natural or norma interaction between organism and environment. "Menta health is not a tight rope upon which the individual walks but wide lane or zone within which there is considerable latitude o movement."[2] Therefore, it is often difficult or impossible to sa just where the normal becomes abnormal in behavior, as may b seen in the testimony of experts in almost any criminal trial, o even in our efforts to understand the behavior of our relatives friends, and associates, or even our own behavior.

The total pattern or characteristic mode of reaction of th individual to his environment constitutes his *personality*. I keeping with Doctor Patrick's idea of the unity of the individua we may say that mental disorders are personality disorders, an they are often spoken of in this way. Personality disorder simply are failures to achieve harmonious relations with environ ment, or failures to adapt in the usual ways which human experi

[1] Patrick, G. T. W., *What Is the Mind?*, The Macmillan Company, 192

[2] Robb, R. W., Osawatomie State Hospital. From correspondence.

ence has come to regard as normal or advantageous. The human organism and its relations to environment (its experiences) are so complex and involve so many unknown or incompletely known factors that no perfectly comprehensive or completely satisfactory classification of personality disorders is yet possible.

The inheritance of mental defect and mental disease seems now to be regarded in much the same light as the inheritance of physical disease (page 29). The genes which come from the past to a given individual (page 28) determine for him the pattern or type of body and of temperament that are possible for him to achieve. It depends upon environment whether he ever does attain his full capacity of structure and function in his body-mind. If both sides of his inheritance have presented him with a meager assortment of genes for cortical development he will be mentally deficient. The degree and specific character of this deficiency may vary from practical absence of cortex (microcephalism) to a possible inability to comprehend mathematics or music. Such brain mechanism as the individual has will function harmoniously, as far as its capacity goes, as long as conflict with environment does not occur of such a character that the organism is unable to make the necessary adaptations.

It will be obvious that the mind may be defective at birth, it may become defective, or it may be normal at birth and later become deranged. In other words it is now believed that personality types may be inherited which do not stand up very well against adverse experiences with environment, but specific mental derangements and disorders are not inherited as such. The specific personality distortion will depend both upon the inherited type and upon the particular kind of crippling experience it encounters.

The point at which the individual becomes permanently arrested in mental development is called his "mental age." The particular pattern or degree of mental activity at the given mental age is the intelligence quotient or I. Q.

Mental deficients are commonly divided into three classes: *idiots*, who never leave infancy, who never advance beyond a mental age of 35 months and an I. Q. of 24; *imbeciles*, who fall within a mental age range of 36 to 83 months and an I. Q. range of 25 to 49; *morons*, or high-grade defectives, who may have a

mental age of 7 to 12 years and an I. Q. from 56 to 74. Such individuals may appear quite normal and get along in society as long as no more judgment or responsibility is required of them than would be appropriate for children of 7 to 12 years of age.[1]

The extent of mental deficiency in the United States is not accurately known since there is no official registration. In 1930 there were 159 institutions for the care of the feeble-minded with a population of approximately 62,000, or a rate of 50.6 inmates for every 100,000 population of the United States. Howard and Patry estimate that of the 45,000,000 children in the United States 450,000 (one in every 100) are mentally retarded.[2]

Causes of feeble-mindedness may be divided into those operative before birth (hereditary and congenital) and those operative after birth. Hereditary deficiencies may occur from unfavorable combinations of genes in apparently normal strains, and such chance occurrences cannot be predicted. Mating deficients with deficients results inevitably in defective strains in which deficiency becomes dominant.

A child may have normal inheritance and his brain may become chemically or physically injured before birth. Chemical injury to brain structure may result from disease, notably syphilis (page 249), endocrine imbalance, as in thyroid deficiency (page 129), or from the poisons of lead, opium, or alcohol. Mechanical injury may occur from the use of forceps in difficult labor. Following birth, injury to structure and function of the brain of the growing child may result from disease such as meningitis, encephalitis, syphilis, acute fevers, or continuous convulsions. Chemical injury may occur from endocrine imbalance, deficient diet, or excessive or unwise use of drugs. Mechanical injury may occur from falls, blows, or pressure from tumor. Functional injury (accompanied by no one knows what organic changes) may result from excessive emotional strain (especially when accompanied with improper feeding and fatigue), such as continuous fear, severe physical or mental repression and restraint, continuous thwarting, excessive punishment, etc.

[1] Williams, Frankwood E. (ed.), *Proceedings of the First International Congress on Mental Hygiene*, Vol. II, p. 783, International Committee on Mental Hygiene, 1932.

[2] Howard and Patry, *Mental Health*, Harper & Brothers, 1935.

Treatment consists, first of all, in placing the child in a normal situation and giving him time to attain normal reactions to the full extent possible for his organism. Often or usually this means removal of the child from the environment which has injured him, and placing him in a foster home or an institution. Occasionally the home situation can be normalized, but more often not. Expert medical and psychiatric care should be given every child who deviates in any degree from the normal. Specialized instruction for all nontypical children should be provided in every school system.

Prevention is, primarily, prevention of propagation among defective strains. Segregation, sterilization, and medical certification for marriage are the three social instruments for accomplishing this. Theoretically birth-control information should help. Actually, effective contraceptive practices require more sense of responsibility and more intelligence in application than defective individuals possess. Marriage of the definitely unfit should be prohibited both because of the probability of transmitting defective genes and also because of the unfitness of such persons to care for and train children.

Mental disorders, as has been said, assume a baffling and bewildering variety of manifestations, and there is no clear-cut or generally accepted classification. As psychologists study normal types of human beings they seem to see two rather definite body-mind complexes, which (unfortunately for efforts at analysis) tend to merge and overlap rather than always to stand out clearly in individual instances. It affords a glimmer of order and understanding, however, to begin to see that normality merges into abnormality and that both represent the necessary interaction of hereditary structure with environment, and that one type of personality will bend or retreat where another type will resist, no matter whether the situation is normal or abnormal.

A great deal has been written about *extrovert* and *introvert* personality, and all of us can recognize these respective tendencies in ourselves and in our friends. Most persons react introvertively (retreating) in part and extrovertively (aggressively) in part, but most of us incline consistently to react rather typically one way or the other. Curiously enough, body build seems to present associated types; so we are reading about the "short-thick,"

"pyknic," "lateral" physical type as it is variously called, which tends to be associated with extrovert, "tough-minded," aggressive personalities. We also read about the "tall-thin," "asthenic," "linear," type of body build which tends to be introvert, "tender-minded," retreating in personality.

In society the extroverts are the organizers, administrators, and *doers.* The introverts are the artists, the philosophers, and the *dreamers.* The inclination to fight, resist, and become angry in the face of difficulties characterizes the extrovert, who shows intensification of these characteristics when he becomes deranged, and he may at last develop *manic-depressive* psychosis or insanity. The inclination to retreat in fear, to evade reality, and to avoid consequences follows the introvert, and may result in entire dissociation of personality in *schizophrenia* (*dementia precox*).

In addition to excessive retreat or defense as just discussed, many distortions of behavior and personality and many disintegrations in body-mind reaction may be produced by physical causes, such as toxins of disease in syphilis or lethargic encephalitis; by epilepsy; by brain tumors; by alcohol, lead, or narcotic poisons; or by mechanical injury. Even in these the personality pattern may show in the particular behavior disorder.

Since the personality pattern develops with the child and since behavior disorders appear early and tend to be progressive, mental disorders are considered, by many psychiatrists, to be in general progressive and to have their beginnings early in life. The behavior disorders of childhood naturally should be mentioned first in any genetic classification of mental derangement. When the early environment conflicts with the normal growth urges of the child he reacts according to his type. If he is definitely extrovert he fights his situation by throwing tantrums, refusing food, cruelty, destructiveness, defiantly running away, stealing, negativism, etc. If he is definitely introvert, he becomes timid, repressed, full of fears, secretive, solitary, lies to protect himself, runs away to escape, sleeps badly, eats badly, etc. Any combination of these may be found, as the types are seldom entirely clear-cut.

It is now believed that the environment is responsible for behavior disorders in young children, and that the disorders of later life usually, if not always, have their beginning in these early

distortions of personality.[1] Dr. Elizabeth Adamson of Columbia University found one and only one common factor of experience in a series of 500 widely varied psychiatric cases; this was unhappy parent-child relationship.[2]

Older children and young adults tend to continue these characteristic trends to the degree in which school and community also enter into conflict with the developing individual. Fortunately many children find corrective influences in later associations when they go out from the home, and become more or less harmoniously integrated in their wider social world. The extrovert child may, however, continue to be highly defensive and may be jealous and quarrelsome—a difficult and unhappy personality. He may become a bully, a liar, a truant, an aggressive sex pervert, a thief, or a delinquent. The child may come before the court and may run the gamut of reformatory and prison, or he may break down in his body-mind integration and in adult life acquire delusions and irrational, even maniacal behavior, in which he may commit murder or suicide, or he may end his days in a custodial institution as a case of manic-depressive psychosis or insanity.

The introvert child who does not find corrective influences, or who meets distorting conditions after early childhood, as may occur with orphans or others experiencing change of environment, tends to become increasingly solitary, detached from reality, secretive, overwhelmed with a sense of inferiority from which he seeks escape in daydreams or abortive boasting. Secret sex perversions, protective lying, morbid fears, excessive nervous instability with dissociation from reality (schizophrenia) may appear as time goes on. This type (together with border-line cases of mental deficiency) furnishes as to social integration the habitual paupers, the petty criminals, and, especially, the vagrants and wanderers.

When subjected to sudden and overwhelming fear or grief the introvert may react in the extreme form of dissociation from reality known as shell shock. If definite personality disintegra-

[1] Kimberly, Charles H., "The Psychoneurotic Depression," *Journal of the American Medical Association*, Oct. 3, 1936.

[2] Adamson, Elizabeth I., "Common Factors Relating to Five Hundred Psychiatric Cases," *Proceedings of the American Association on Mental Deficiency*, 1934.

tion occurs the introvert becomes the schizophrenic (split personality) or the paranoiac (twisted personality, delusional insanity), which are distinct types of psychosis.

College students, in common with humanity in general, present extrovert and introvert tendencies, and many students have not been altogether successful in integrating harmoniously with former environmental conditions. Many types of psychoneuroses, mild or definite, appear in every social group, including student groups. Students may come into very positive personality conflict with social relationships in college life; with academic requirements beyond their natural capacity; with economic difficulties; with new and strange philosophies which may confuse them.[1] Such students may develop "nervousness," neurasthenia (excessive fatigue), hysteria (erratic nervous behavior), fears (phobias), compulsory ideas which may even become delusional (without basis in fact, such as a conviction that a certain professor "has it in" for one). There should be, in every institution of learning, mental hygiene advisers whose business it is to identify and assist students who are having difficulty in personality adjustment, and every student who is not experiencing a sense of satisfactory accomplishment and joy in living should seek all available legitimate aids.[2] The first step toward acquiring a normal personality is to accept the fact that life is beset with difficulties and that surmounting one's particular "hurdles" is the greatest achievement in human experience, and one which brings the highest satisfaction.

Treatment and prevention of personality disorders of every sort consist, as in the instance of mental defect, in placing the individual in an environment sufficiently normal to permit the sensitive neural mechanisms to recover balance, whereupon many difficulties, particularly the incipient disorders of childhood, spontaneously disappear. Parent education, including instruction in child development and behavior, is basic to full protection of the child and the adult which he is to become. Behavior

[1] Goodenough, Florence L., *Developmental Psychology*, Chap. XXII, "Motivation of Behavior at the College Level," D. Appleton-Century Company, Inc., 1934.

[2] Quacks and cults, however, thrive upon maladjusted individuals. No student should seek advice from other than official and recognized sources.

clinics should be available for every child at the first recognition of problem behavior. Visiting teachers and mental hygienists should be connected with every school system. Every probate judge and every probation officer should have psychiatric training, and there should be a psychiatrist on the staff of every court and every institution for the care of the defective, dependent, or delinquent.

Insanity is a legal term used to indicate a mental condition such that the subject is irresponsible and the law must take measures to insure his care and safety and also protect others from injury by him. The term insanity is no longer used by scientific or professional authorities, since it strictly indicates nothing as to the deranged persons's case except that he may be legally deprived of his liberty because of his mental state.

The extent of mental disorder in the United States is appalling, and seems to be increasing. The statistical increase may be partly due to the fact that types of cases are now committed to institutions which formerly would have been kept at home or in poorhouses. There is actual increase, however, owing doubtless to the increasing complexity of modern life and the many forces impinging upon personalities which are not sturdy enough to stand the pressure.[1] It would seem that the human organism is either, as yet, poorly adapted by evolution to withstand mental and emotional stress and strain, or it is being abruptly forced by present world conditions to carry a greater load than it can bear.

There were in 1930, in the United States, 564 institutions for the care of mental disease. In 1929 92,595 patients were admitted to these institutions for the first time, and at the close of the year there were 338,251 inmates in residence, or 277.7 for every 100,000 population.[2] This is more than the total number of patients found at any one time in all other hospitals combined,[3] and more than all the students in attendance at one time in colleges and universities. It is computed that approximately 4 to 5 out of every 100 children now born alive and 1 out of every 19 high-school pupils will at some time in life become inmates of institu-

[1] MEYERSON, ABRAHAM, *The Inheritance of Mental Diseases*, p. 315, Williams & Wilkins Company, 1925.

[2] *Proceedings of the First International Congress on Mental Hygiene*, p. 780.

[3] HOWARD and PATRY, *op. cit.*, p. 486.

tions for nervous and mental disease.[1] The economic cost of mental disability in all its forms constitutes a terrific public and private burden. This is a situation which must be appreciated by college students and accepted as a personal responsibility and a personal challenge.

Summary.—The mind-body (personality) interaction with environment is one unified story. If the organism is able to adapt competently to environment it is said to be normal. The environment, particularly the complex modern social environment, distorts the personality, particularly during the susceptible years of growth, in many ways and many degrees. There is no difference, except in degree, between normal and abnormal reactions; therefore no stigma should attach to queer or deranged behavior. While certain constitutional "make-ups" succumb more readily than others to stressful situations, every organism has its limit of endurance. There probably is no such thing as direct inheritance of mental disorder, and no more disgrace should attach to mental illness than to any other form of illness.

Mental disorders tend to arise in childhood because of conflict between the developing personality of the growing child and his world. Mental disorders tend to become progressive and, unless the cause is removed or capacity for resistance built up, may terminate in complete mental and social incapacity.

While the forms of mental deviation are at present too complex and variable and too little understood to be clearly classified, a glimmer of orderliness appears in the observed fact that certain types of body-mind organization behave in typical and characteristic ways both as normal and as neurotic or psychopathic individuals. This statement oversimplifies the situation, since heredity bestows mixed characteristics upon most individuals. The idea is helpful, however, both in understanding one's own behavior and in attempting to understand and classify the behavior of others.

References

Adamson, Elizabeth I.: "Common Factors Relating to Five Hundred Psychiatric Patients," *Proceedings of the American Association on Mental Deficiency*, 1934.

[1] Goodenough, *op. cit.*, p. 556.

BEERS, CLIFFORD: *The Mind that Found Itself*, Doubleday, Doran & Company, Inc., 1923.

BENTLEY and COWDRY: *The Problem of Mental Disorder*, The McGraw-Hill Book Co., Inc., 1934.

BURNHAM, WILLIAM H.: *The Normal Mind*, D. Appleton-Century Company, Inc., 1924.

———: *The Wholesome Personality*, D. Appleton-Century Company, Inc., 1932.

COBB, STANLEY: *A Preface to Mental Disease*, William Wood & Company, 1936.

GOODENOUGH, FLORENCE L.: *Developmental Psychology*, D. Appleton-Century Company, Inc., 1934.

HOWARD and PATRY: *Mental Health*, Harper & Brothers, 1935.

MARSTEN, L. R.: "The Emotions of Young Children, A Study in Introversion and Extroversion," *Studies in Child Welfare*, University of Iowa, 1925.

MENNINGER, KARL: *The Human Mind*, Alfred A. Knopf, Inc., 1930.

MEYERSON, ABRAHAM: *The Inheritance of Mental Diseases*, Williams & Wilkins Company, 1925.

MORGAN, JOHN J. B.: *Keeping a Sound Mind*, The Macmillan Company, 1936.

PATRICK, G. T. W.: *What Is the Mind?*, The Macmillan Company, 1929.

PENROSE, L. S.: *Mental Defect*, Farrar & Rinehart, Inc., 1934.

PRESSEY and COLE: *Mental Abnormality and Deficiency*, The Macmillan Company, 1928.

Proceedings of the First International Congress on Mental Hygiene, International Committee on Mental Hygiene, 1932.

WHITE, W. A.: *Twentieth Century Psychiatry*, W. W. Norton & Company, Inc., 1936.

UNIT III

CARE OF ILLNESS IN THE HOME

CHAPTER XXVII

GENERAL CONSIDERATIONS IN CARE OF THE SICK

Anticipating Trouble.—When a young couple set up housekeeping they should give thought to the fact that, sooner or later, there is illness in every home. Illness should always be more or less completely isolated in the interest both of the patient and of the family. Therefore, the house or apartment selected should have at least one room which can be closed off from the rest of the dwelling, in which a sick person may be made comfortable and receive proper care.

Every homemaker should be prepared to meet health emergencies. She should keep adequate equipment on hand and in good order. She should have books, pamphlets, or notes giving usable information in quickly accessible form. The various members of the family should be trained to meet emergencies requiring quick action, such as fire, hemorrhage, choking, asphyxiation, etc. Every child should be made familiar with the contents of the home medicine cupboard and their uses.

The Sick Room.—In selecting a room for illness the homemaker should have the several attributes of an ideal sick room in mind and realize as many of them as possible.

1. It must be possible to close off the room from the part of the house used by other persons.

2. It must be possible to maintain a reasonable degree of quiet. The room should be removed from noisy plumbing, loud or harsh street sounds, or disturbing noise of any sort.

3. It must be possible to control heat, light, and ventilation, according to season, temperature, and character of the illness.[1]

4. The room must be large enough to permit the nurse to go around three, preferably four, sides of the bed.

[1] A single room may be warmed by a small electric or gas heater, by an oil burner carefully regulated or, lacking these, by a small airtight wood or coal heater, the pipe of which may be carried through a piece of galvanized iron inserted above the lowered sash of a window.

5. If the home nurse must also do the work of the house the sick room should be located as conveniently as possible for her. It may easily happen that the living room is the most suitable room in the house. The family should be willing to make the necessary sacrifice for the benefit of the two most concerned—the patient and the home nurse.

Furniture and Equipment.—It is no longer considered necessary to have only glaring white furniture and equipment for illness, in either home or hospital. Finishes for wood and metal are now so durable and colors are so freely used in everything that the homemaker may follow her inclinations in selecting style, finish and color harmonies, and still have furniture, linen, and draperies suitable for the modern sick room.

THE BED is the most important item of equipment for illness. Its width must be not over 36 to 40 inches, so as to permit the nurse to turn and handle the patient from either side. The mattress must be high enough (30 or more inches from the floor) that the nurse will not have to stoop in handling the patient and in making the bed. If the homemaker does not want her beds set high she can, in case of illness, raise the springs by putting narrow blocks under the corners of the spring inside of the bed frame, or elevate the entire bed on boxes placed under the head and foot pieces, or on large blocks (sawed from 6 by 6 building beams) placed under the legs. For the last-named method, casters must be removed and the ends of the bed posts set in hollows in the center of the blocks in order to prevent possible slipping, or if the legs are hollow they may be anchored on heavy nails driven in the center of the blocks (Figs. 121 and 122). In the case of severe injuries it is sometimes possible to rent from a hospital or furniture store a "fracture bed," which greatly simplifies the care of such a patient. *The springs* must be free from sagging and should be fairly firm, as it is more comfortable to lie continuously upon a level surface than upon a soft bed. Nonrustable, flat-linked springs are perhaps the best inexpensive springs for this purpose (Fig. 81).

The mattress should be firm and free from irregularities. The cover should be in fast colors. The old-fashioned "A.C.A." blue-and-white striped, boilproof ticking is still perhaps the most practical covering for both mattresses and pillows. The filling of

the mattress should be long-fibered, clean, resilient cotton. A young homemarker should insist on seeing a cross-section of the mattress she buys (Fig. 79).

Pillows used in illness should be rather full and firm. "Live" goose feathers or down (from molting live fowls, rather than from dead market fowls) make the best filling.

The bedding consists of a quilted mattress pad; sheets, which should be 18 inches larger all around than the mattress; single blankets, either cotton or wool; a washable, light-weight spread; plain pillow cases.

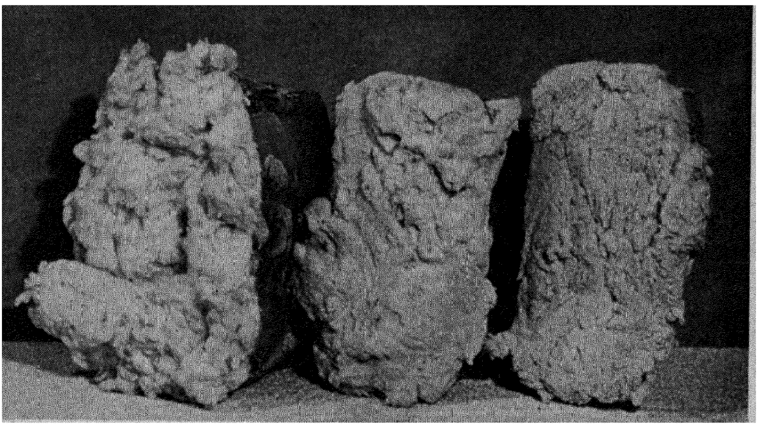


FIG 79 —Cross sections of different grades of mattress made by one factory

THE OTHER FURNITURE consists of the ordinary bedroom furniture such as a dresser, tables, lamps, etc. There should be a *bedside table,* the top of which should be on a level with the mattress in order that the patient may conveniently handle articles placed upon it. There should be a *nurse's work table* of sufficient size to hold records and equipment. There should be *one easy chair,* preferably with the back high enough to support the head, and *two straight-backed chairs.*

If the patient requires night service there must be in the household equipment a folding cot for the use of the nurse at night.

The usual draperies, curtains, pictures, and ornaments will be suitable except in case of contagious or long-continued illness where ease of cleaning becomes a definite consideration. It is an

advantage to have the sick room quite free from unnecessary articles of furniture and ornament, but it should always be attractive.

Equipment for Illness and Emergencies.—Some place in every home should be set apart for emergency equipment. The family should be trained to let this alone and not borrow articles from it without replacing them. The articles of equipment, practicable and necessary to be kept on hand, will vary with the personnel of the family, the distance from a drugstore, the health of the members, etc. In general, it is unnecessary to purchase items which can be quickly obtained at a near-by store, or special equipment which may be used seldom or never.

The medicine cupboard should be dustproof and as ample in size as the available space will admit. Any old cupboard of suitable size and solid construction may be painted and enameled at home and be placed in some closet or room accessible to all members of the family. The ordinary bathroom cabinet should never be used for both medicines and toilet supplies. Accidents are likely to occur, and it is impossible to keep medical supplies in proper order when they are jumbled in with other things.

For the ordinary town family, with a drugstore a few blocks away the following list of items will be fairly adequate:

Internal Remedies.

1. A general cathartic, which may be any preferred mild laxative such as milk of magnesia. A saline laxative for use when very quick and thorough evacuation is indicated, as in some types of poisoning or acute indigestion.
2. A general stimulant for use in shock or collapse. Aromatic spirits of ammonia is perhaps the best all-purpose stimulant. A couple of ounces is all that need be kept on hand.
3. Aspirin for treatment of incipient colds, relief of painful menstruation. headache, etc., may be legitimately kept on hand providing the family understands that rest in bed should always accompany the administration of aspirin or any other coal-tar drug, and also providing the use of a pain relief does not cause the individual to neglect treatment necessary for cure of the condition (see page 361).

External applications should include:

1. A large bottle of all-purpose antiseptic diluted and ready for use. Dakin solution is one of the best (see page 367).
2. An antiseptic, such as mercurochrome or tincture of iodine, for painting small abrasions of the skin.

3. A mild mouth and throat antiseptic, such as hexylresorcinol (S. T. 37) or one of the numbers of proprietary alkaline mouth washes.
4. A tube of sterile lubricant, such as white vaseline.
5. A tube of nasal salve medicated with ephedrin may be kept for treatment of colds.

Dressings for injuries should include:

1. Two narrow finger bandages and two bandages 2 inches wide.
2. A small package of absorbent cotton.
3. A small package of sterile gauze.
4. A 2-inch roll of adhesive plaster.
5. A paper of safety pins.
6. A jelly glass filled with toothpick swabs.
7. A box of wooden tongue blades.
8. A box of wooden applicators.
9. A box of pipettes may be added but may usually be quickly purchased if needed.

Miscellaneous equipment includes:

1. A clinical thermometer.
2. A graduated medicine glass.
3. A splinter forceps.
4. An apparatus such as a fountain syringe for giving enemas and irrigations.
5. Some device for applying artificial heat. A combination hot-water bag and fountain syringe will take care of (4) and (5).
6. A small basin for holding solutions.
7. A package of paper napkins or paper handkerchiefs, or a roll of paper toweling.
8. A glass eyecup is a convenience, but not an essential. A bottle of boric-acid solution may be provided, although boiled salt water will do very well for an eyewash in an emergency.

Care of Equipment.—All rubber articles must be kept dry and, if possible, partly filled with crumpled tissue paper. Hot-water bags should be inflated with air and put away with the stopper screwed in to prevent the inner surfaces from sticking together. It is a good idea to grease the stopper to prevent its rusting or sticking if, as often happens, months may pass without the bag's being used. Rubber tubing should be drained and coiled—stopcocks should be left open. Rubber gloves should be dried, powdered with talcum powder, turned and powdered again, and laid away straight with tissue paper inside the palms.

Glass, crockery, and metal must be sterile and polished and put away ready to use. Turning basins, cups, etc., upside down prevents dust from adhering to the inside. Only a quick wiping with an antiseptic will then be necessary at the time of using.

In Chap. XXXVI will be found description of improvised equipment.

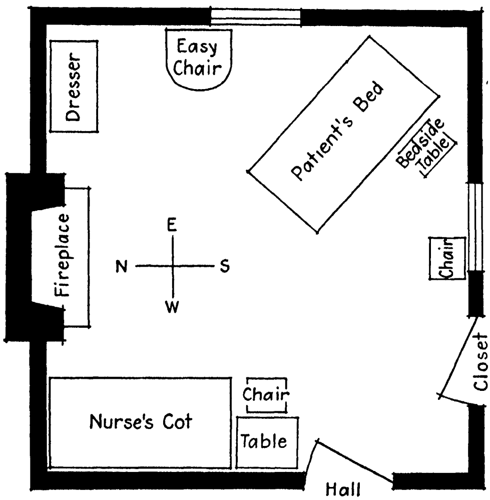


Fig. 80.—Floor plan of a well-arranged sick room.

Arranging the Room for a Patient.—The proper placing of the bed is the most important consideration in arranging the sick room. The following points are to be noted (Fig. 80):

1. The patient must not face a direct light.
2. The patient should be able to see the door easily.
3. The nurse must be able to go freely around the foot and both sides of the bed. If necessary the head of the bed may stand against a wall.
4. The bed should stand where the ventilation is good.
5. The bed should, if possible, be across the room from the entrance.

The bedside table should for a right-handed patient stand at the latter's left elbow. On the bedside table should be placed a bell, a clock or watch, fresh water, a handkerchief or paper squares, and anything else the patient may require.

The nurse's table and cot should stand as near as possible to the door leading out of the room in order to save steps and to reduce movement and confusion within the room to a minimum.

Chairs should stand against the wall or in front of tables. The floor space should be kept open.

Pictures, flowers, and ornaments should be placed with reference to the patient's enjoyment of them; within easy range of vision and tastefully arranged. (Draw a floor plan of your own room showing windows, doors, size, etc. Suppose someone to be ill in the room; arrange the furniture to the best advantage.)

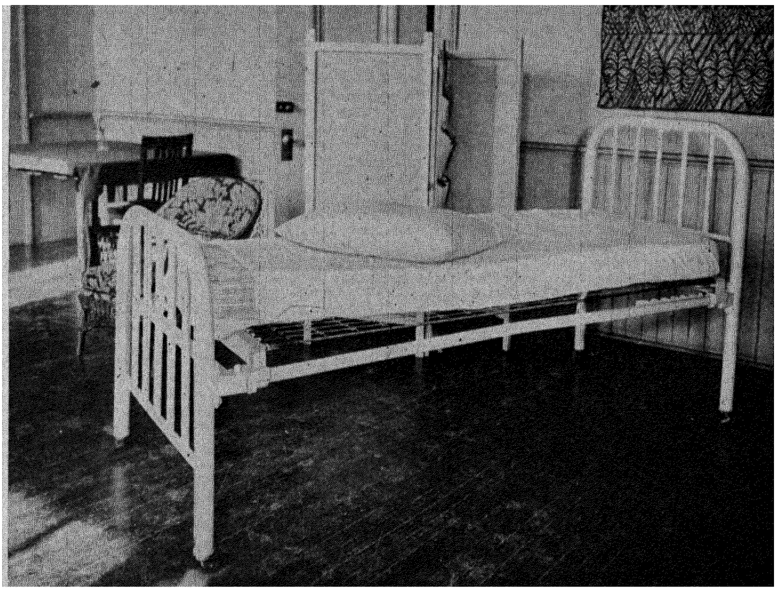


FIG. 81.—A steel tubing bed having a flat-linked, nonrustible spring. The mattress is covered with blue and white boil-proof ticking. The muslin slip cover is shown turned back. The pillow is plump and well filled with down.

Making the Bed.

1. Assemble all necessary articles.
2. Place mattress pad on the mattress. If you do not have a regular pad use a quilt or cotton blanket to protect the mattress and furnish a smooth surface.
3. Spread a sheet over the mattress pad, making certain that the center lengthwise fold of the sheet is exactly in the center of the mattress.
4. Leave plenty of sheet to fold under the mattress at the top, as this serves to anchor the sheet firmly.
5. Fold the sheet under at head and foot and miter the corners. Draw the sheet smoothly and firmly all the time and fold all surplus under as far

as it will go. The object is to provide a bed which cannot wrinkle or come to pieces.

To Miter Corners.—Fold the sheet under smoothly at top and at bottom leaving it hanging on the sides. Lift the side near a corner in such a way

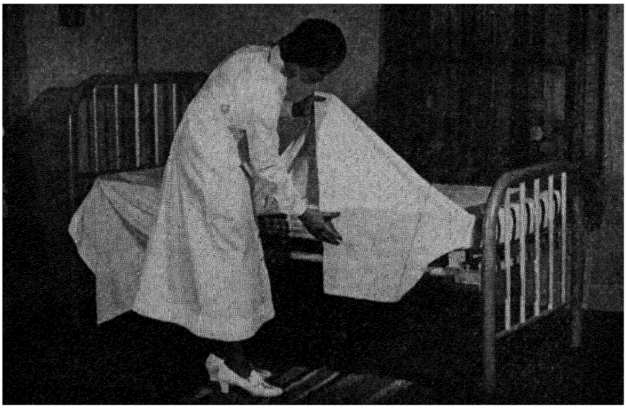


FIG. 82.—To miter the corner hold against the mattress.

that the horizontal edge is straight with the edge of the bed rail. The corner should hang at a right angle and the fold should be a true bias. Lay the bias corner over the mattress, hold the hand against the sheet at the upper edge of the mattress to prevent the sheet from slipping, and let the

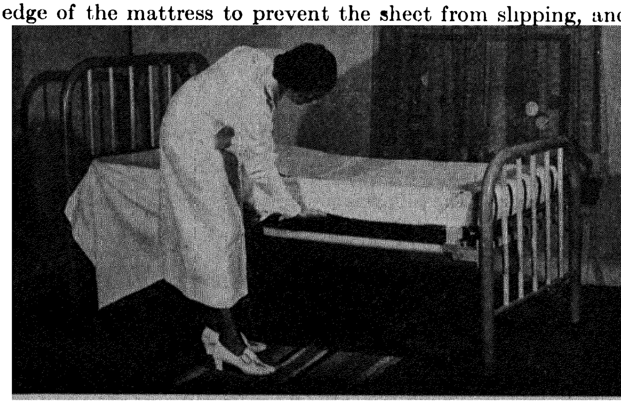


FIG. 83.—To miter the corner: fold sheet under.

bias fold drop over the hand (Fig. 82). Now fold the side of the sheet under smoothly as far as it will go (Fig. 83). Repeat for each of the corners. The technic is exactly the same as for wrapping a square package in a piece of paper.

6. *Protective Pad.*—In every case of illness requiring the use of a bedpan a layer of protective material should be placed under the patient's hips. A square of hospital rubber sheeting is preferable; in an emergency a square

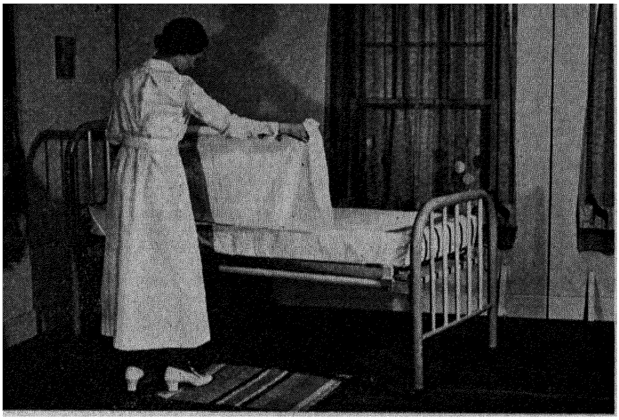


FIG. 84.—Place draw sheet over the rubber sheet.

of table oilcloth, the back of an old raincoat, or even a thick pad of newspaper may be used.

7. *For a "draw sheet"* a muslin sheet is folded crosswise and placed over the rubber square, the folded edge at the top (Fig. 84). The rubber square

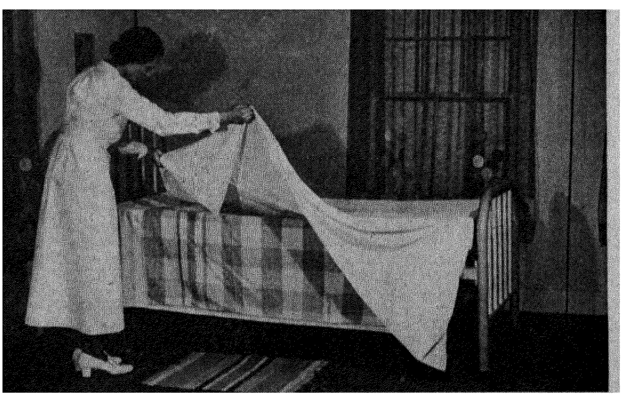


FIG. 85.—Space blanket and spread from the top so they will cover the patient's shoulders.

is placed approximately in the center of the mattress and the muslin sheet tucked firmly under the mattress as far as it will go. The weight of the hips then keeps the sheet from slipping or wrinkling. In hospitals this is

called a "draw sheet" since it is easy to withdraw it from under the patient. The mattress is thus covered smoothly and firmly and will not wrinkle under the patient, no matter how restless.

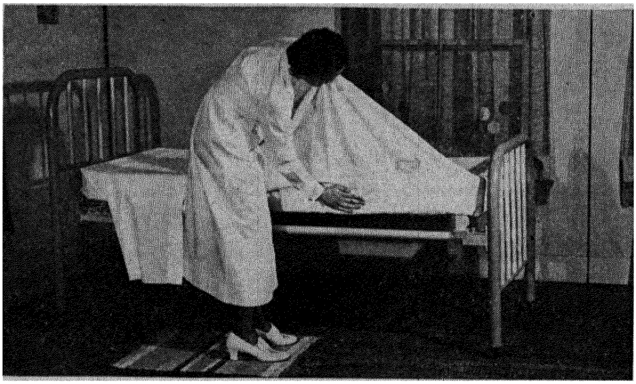


FIG. 86.—Turn back top sheet and half-miter the corners together.

8. *The top covers* include sheet, a single blanket, and a spread. It is wise to place a minimum amount of covering between the upper sheet and the spread. Further covers are added as needed without disarranging the bed. *The top sheet* is spread right side down with the central lengthwise

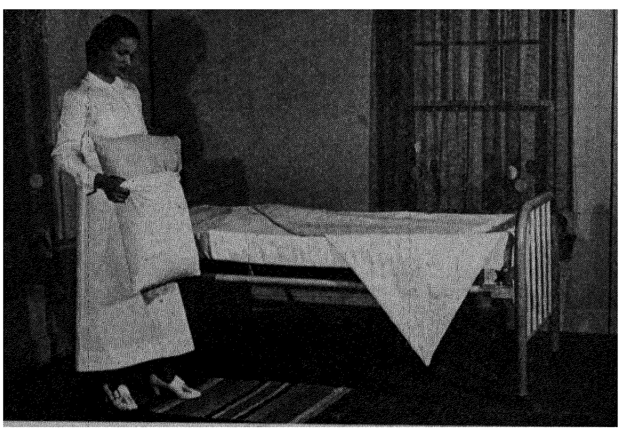


FIG. 87.—Put on the pillow case and fold covers back ready for the patient

fold in the exact middle of the bed. Allow enough to turn under well at the foot but leave generous surplus at the top. *The blanket* is placed over the sheet with the top edge where the shoulders of the patient will come (Fig. 85). The surplus here is turned under smoothly at the bottom.

The spread is placed with the top edge just over the top edge of the blanket. The surplus is turned under smoothly at the bottom.

9. Now take the three covers together at the foot of the bed, carefully smoothing all wrinkles, and proceed exactly as in mitering the corners of the under sheet except that you do not fold under the sides. This is called "a half miter" (Fig. 86).

10. The last step is turning the upper edge of the sheet back over spread and blanket. This brings the hem right side up. The three top covers are now firmly locked together by the half miter at the bottom and the turned-over sheet at the top. The sides are not tucked in; therefore the patient can turn freely withou disorganizing the bed. If the bedstead has deep sides the top covers will have to be completely mitered, but must be turned under loosely to give room for movement.

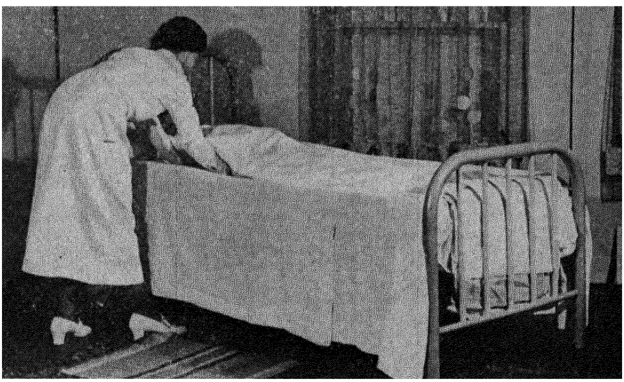


FIG. 88.—Loosen bedding from the mattress and draw patient over to one side of the bed.

11. *The Pillows.*—To put a case on a pillow gather it up along the seams in the two hands, put each lower corner of the pillow in a corner of the case, and draw up the case much as you put on silk stockings (Fig. 87). It is not necessary to hold the pillow under the chin or between the teeth.

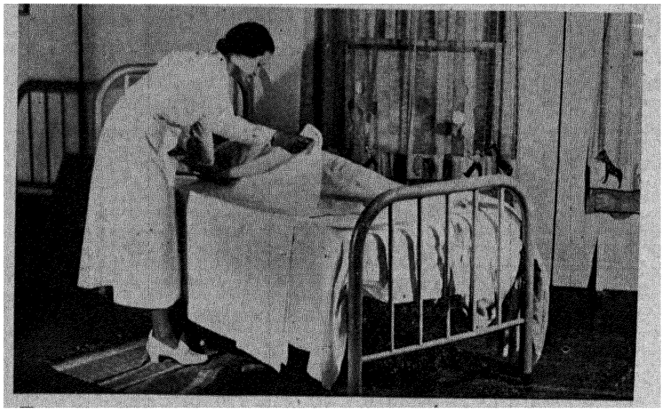
Care of the Patient. *To Change the Bedding with the Patient in Bed.*

1. Loosen everything from the mattress by running the hands entirely around underneath the lower sheet. Do this carefully without jerking or disturbing the patient (Fig 88).

2. Remove the spread, fold it carefully into its original creases, and place it aside. If the room is quite warm the blanket also may be removed and folded.

3. Place the fresh pillow on one half the bed at the head and assist the patient to move over to that side of the bed as far as possible, certainly beyond the center fold of the sheet.

4. Fold the remaining top covers back over the patient, exposing one-half of the bed.



5. Roll the draw sheet toward the patient, making the smallest possible roll, and leave it on the other side of the center fold and tucked under the edge of the patient's body (Fig. 89).

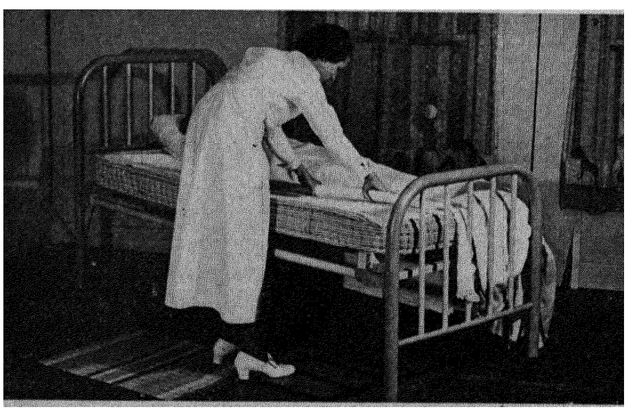


FIG. 90.—Finish one half of the bed; move patient onto this half, then unroll the clean sheets on other half.

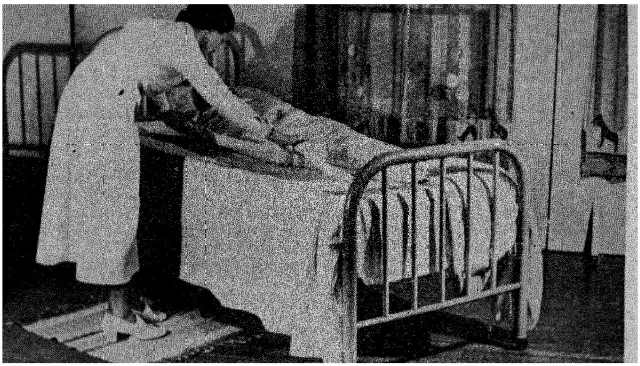
6. Lay the rubber sheet smoothly back over the patient.

7. Roll the under sheet in small compass past the center of the bed.

8. Spread the fresh under sheet, estimate the amount which is to be turned under at top and bottom, then roll the half *toward you* which is to go under the patient. Place this roll snugly against the soiled sheet (Fig. 90).

9. Smooth out the rubber sheet.

10. Roll half of the fresh draw sheet (toward you), and place the roll against the lower sheet, and turn under at the end.
11. Now miter the corners and tuck under the sides.



12. Spread out the top covers and assist your patient to move over on the fresh half of the bed.
13. Go to the other side, remove the soiled sheets, unroll the fresh sheets and finish this side (Fig. 90).
14. Remove the blanket, if still in place.

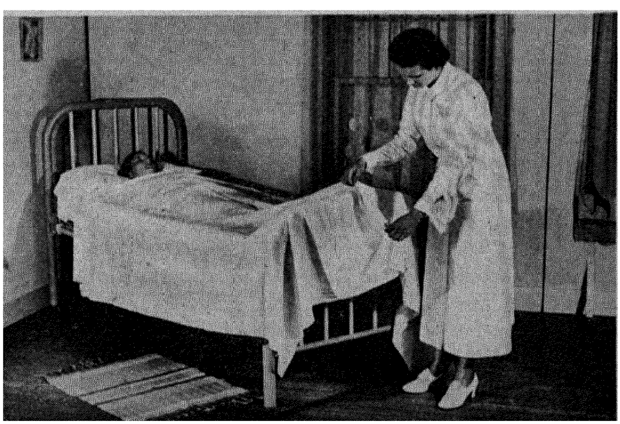


Fig. 92.—Lay a pleat in covers to make room for the feet.

15. The top sheet is unfolded, spaced, half of it rolled and slipped under the soiled top sheet. It is unrolled and the soiled sheet removed without exposing the patient. The blanket and spread are placed and the bed finished exactly as in making it the first time.

If the patient is tall and finds difficulty in moving the feet freely under the tucked-in covers a large pleat may be taken in the center of the top covers before they are folded under the mattress at the bottom (Fig. 92).

The last step is restoring the patient to the center of the bed with the fresh pillow comfortably adjusted and finishing with the half miter at the bottom of the covers (Fig. 93).

Handling Helpless Patients.

1. The nurse must learn to assume a posture which will protect her own back from strain and at the same time give her the strongest leverage from her arm, back, and shoulder muscles. This posture is secured, with a bed of the usual height, by placing one foot in advance of the other and bending

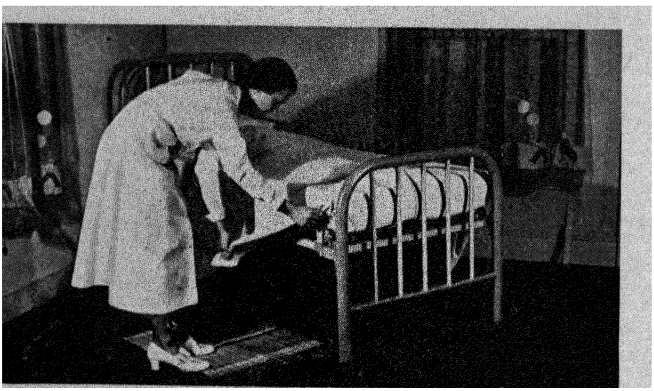


FIG. 93.—Finish the corners with a half miter.

slightly backward. This protects the weakest place in the back—the place where the spinal column joins the pelvis. Spreading the feet gives a broad base of support from which the arms can pull, drag, or lift with maximum power.

2. If a completely helpless patient must be moved, as when the bed is made, the nurse should assume the position described, then spread both hands, palms up, and work them under the shoulders of the patient far enough that she can move her fingers enough to get a slight grasp of the body.

3. She then curves in her back, throws her shoulders backward with a strong pull, and, literally, drags the upper part of the body toward her. She goes to the hips and repeats this procedure; she then moves the feet and legs and helps the patient assume a comfortable position. Notice position of nurse in Fig. 88.

To Help a Patient into a Chair.—The nurse moves the bedside table out of the way and arranges the chair at about this place at

the side of the bed. The chair should have a back high enough to hold a pillow and support the head of the patient. Usually a blanket is spread over the chair and wrapped about the body after the patient is seated. A cushion may be placed in the seat of the chair. A footstool or low box should be placed in front of the chair but in a place convenient for the patient's feet when she is sitting on the side of the bed.

If the patient has some use of her arms she will clasp her hands behind the nurse's neck. The nurse bends toward her in the position described for moving a patient in the bed (Fig. 88). The nurse places her hands under the arms of her patient and grasps the body. As she raises the patient the latter swings her feet off the bed to the stool. The nurse then braces herself and pivots the patient around and eases her into the chair.

In returning the patient to the bed the procedure is reversed. The patient clasps her hands behind the nurse's neck and braces her foot; the nurse grasps her body and pivots or swings her about on a half turn to the edge of the bed. She may then place her right arm under the shoulders, her left arm under the knees, and swing her entire body onto the bed.

To Move the Patient up in Bed.—Weak patients tend to slip down in the bed and need to be occasionally pulled up on the pillows. Placing a small box in the foot of the bed upon which the patient may push with one or both feet solves the problem in some situations.

If the head of the bed is open so that the nurse may stand directly behind the patient's head it is very easy to reach through, slip a hand under each shoulder into the axilla and pull. If the nurse must stand at one side she should stand as far above the patient as the head of the bed will allow, slip a hand under each shoulder, and pull in as straight a line as possible. If the patient is not heavy one arm may be placed under the shoulders and one under the knees, and the patient may be shoved toward the head of the bed with a swinging movement.

Changing the Position.—Helpless patients, particularly if they must lie upon the back by reason of a broken bone or operation, suffer intensely from muscle strain and fatigue. A pillow or blanket rolled and placed under the knees relieves the strain upon the leg muscles and also the muscles of the abdomen (Fig. 105).

Small cushions or pillows placed under the hollow in the back and under one shoulder then the other, one hip and then the other, all rest the patient very appreciably.

Changing the Mattress.—If it becomes necessary to place a helpless patient upon a fresh mattress, the mattress should be covered with sheet, rubber square, and draw sheet (exactly as described in making the bed), which are pinned to the mattress on the under side with large safety pins.

One helper stands on the patient's right side, two on the left. The patient is moved to the left edge of the mattress. The helper on the right then draws the mattress toward her until she is holding the free half clear of the springs. On the left side the two helpers place the fresh mattress on the empty half of the spring; they reach over, one placing her hands under the head and back of the patient, the other placing her hands under the hips and knees. They say "ready, pull" and gently and slowly draw the patient onto the fresh mattress. It is then only a matter of withdrawing the soiled mattress and completing the adjustment. A patient may be moved from one bed to another of the same height by carefully drawing the bottom sheet from one bed to the other, the patient moving with the sheet.

CHAPTER XXVIII

PERSONAL CARE OF THE PATIENT

The Morning Toilet and Bath.—The best time to make the daily toilet of the patient is usually soon after the morning meal. The nurse may assemble everything she is to use for toilet, bath, and changing the bed, then give the bedpan for bowel movement. After this is accomplished the nurse proceeds to the toilet of the head and the hands, the body bath, and changing the bed, in the order named.

Equipment.—The nurse will need a large pitcher of warm water, a basin, a receptacle for used water, soap, a very large bath towel, a small face towel, and a wash cloth. She will need a tooth brush, dentifrice, small basin, brush and comb, and manicure outfit. If the patient can turn herself readily, or if the sheets are not to be changed, a cotton blanket may be spread under the body. It is possible, however, to give an entire bath to a helpless patient without dampening the bedding if the nurse has learned to keep the wash cloth under control. She should remove and fold the spread; throw a blanket over the bed, under which she removes the top sheet and blanket.

To Clean the Teeth.—If the patient is able to handle the toothbrush the nurse wets it, applies dentifrice, and hands it to the patient, who scrubs her own teeth. The nurse gives her water as needed to rinse teeth and mouth and holds the basin in a convenient position. If the patient is unable to raise the head from the pillow the nurse pushes the pillow under her head until the edge is even with the cheek; she then holds a rather deep small basin or bowl against the pillow with the edge under the patient's jaw. The patient can thus rinse her mouth thoroughly without raising the head, letting the fluid run into the bowl (Fig. 94). If the patient cannot brush her own teeth the nurse must take toothpick pledgets of cotton, or bits of cotton held with the splinter forceps, and carefully wash every tooth and end by wash-

ing the tongue, permitting the patient to rinse the mouth as described above. A fresh pledget should be used for each tooth. Never dip used cotton into any solution.

To Comb the Hair.—This is simple if the hair is short. If long and, especially, if tangled, it is sometimes not easy. When a woman having long hair goes to bed her hair should be braided in two braids. If the hair has become badly matted during the first acute stage of the illness, as often happens, the nurse should, at the first favorable opportunity, put it in order. She should

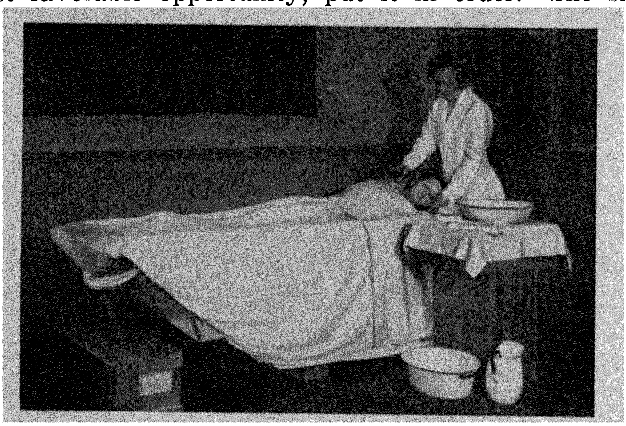


FIG. 94.—To clean the teeth. (The nurse should stand in front of the patient.)

separate a small portion from the rest, and grasp it firmly near the head with her left hand while she brushes and combs with her right. When one lock is straightened it is laid aside and another taken. When as much as half of the hair has been combed it is parted from forehead to nape of neck, braided, and firmly fastened at the end. During this procedure the patient should rest whenever fatigued. At the time of subsequent morning toilets the nurse combs and arranges each side separately as the patient turns on the pillow without raising the head.

To Wash the Face.—The nurse pours warm water in the basin, and spreads the wash cloth over her hand, catching all the corners in the palm (Fig. 95). The fingers should spread inside the cloth. The cloth may then be squeezed until the water will not drip. The nurse should work with a loose, relaxed wrist and should strive for a feeling of "pouring" the hand upon the surface

of the body. This is important in bathing, wiping, or rubbing. The pressure of the hand should be equal over the entire surface. Especially the nurse should learn to treat both sides of the patient's body alike. If the nurse is using both hands this requires particular attention or her left hand will not press so firmly, or work so thoroughly as the right. It is distressing to a fastidious invalid to have an "unfinished" feeling on one side

The nurse should proceed to wash the eyes first by taking the wash cloth over a forefinger and wiping from the inner corner outward. She also washes with her covered finger the creases

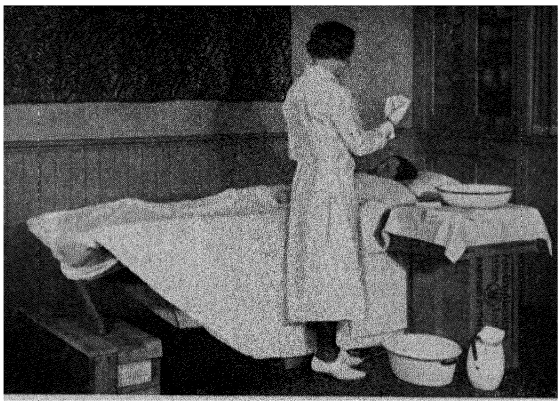


FIG. 95.—Ready to begin the bath.

about the nose, cleft of chin, outer ear, etc. She rinses the cloth frequently in the warm water and gently scours the forehead and cheeks, rolling the flesh over the bone with a smooth, even, rotary movement. She wipes the face, neck, ears with the face towel, using the same scouring motion paying special attention to wrinkles and crevices and leaving a sensation of freshness and stimulation.

To Remove the Gown.—It is now time to remove the gown and continue the bath of the body. If the gown has long sleeves it is brought up under the patient's back until it can be gathered under the arms. If the patient is able to raise the arms above the head the nurse grasps the front of the gown in her left hand, raises the patient's head with the right hand, and lifts the neck

opening over the head without touching the face. It is then a matter of slipping the sleeves off by pulling at the cuffs.

If the patient has one lame arm the gown is brought up, the sleeve is removed from the sound arm first, then the gown lifted over the head and the sleeve carefully removed from the lame arm.

A long gown should never be placed upon a helpless patient, as changing it and keeping it smooth are needlessly exhausting. Pajama jackets may be put on back to front, or old gowns may be torn down the back and fastened with button, snap, or tie at the back of the neck. Hospitals have short bedgowns opening down

FIG. 96.—Bathing the hand.

the back. In a long or chronic illness these should be provided for the home patient.

The Toilet of the Hand and Arm.—The nurse will uncover the arm and spread the large bath towel along the side of the bed, laying the patient's arm on the towel. She will then change the water in the basin, make it soapy, place the basin on the towel, place the patient's hand in the warm suds and wash it thoroughly with the wash cloth, pushing back the cuticle at the base of each nail (Fig. 96). She then bathes the arm to the shoulder, giving special attention to the axillary space. The basin is removed, the nurse folds the towel about the hand and arm, and wipes very thoroughly (Fig. 97), drying each finger separately and rolling the flesh of the arm over the bones. This arm is replaced under the covers and the nurse goes to the other side and bathes the other arm. The

nurse may now sit down and manicure the nails in the usual manner, if this seems to be the most convenient moment. Since however the manicuring may take some time and delay setting

FIG. 97.—Wiping the hand and arm.

things in order for the doctor's call, it may very properly be done at some later free period of the day.

FIG. 98.—Bathing the foot and leg.

The Toilet of the Chest.—When through with arms and hands the nurse pulls down the cover, exposing the chest and abdomen. She folds the bath towel over the edge of the cover to protect it from dampness. She takes fresh warm water, soaps the cloth,

and scours the nipples, navel, and all wrinkles or creases. She bathes and rinses, rubs dry with rotary movement, and covers the exposed portion of the body.

The Toilet of the Legs and Feet.—The nurse uncovers one leg, folding the covers snugly about the other leg and the genitals. She spreads the towel over the bed, places a basin of fresh, warm, soapy water on the bed and raises the patient's knee until her foot rests in the basin (Fig. 98). She bathes the foot with the same care as the hand, taking each toe separately and scouring the bottom of the foot well. The bottom of the foot is often "ticklish," but can be handled if the nurse claps her hand on the surface firmly and quickly and keeps it there. The basin is removed, the leg is wiped with great thoroughness, each toe being wiped separately. With a basin of fresh water the other limb is bathed.

The genitals should be bathed with perfect matter-of-factness. If the patient prefers and is able to attend to this part of the bath, the nurse will only assist.

To Bathe and Massage the Back.—The patient is assisted to turn on side or face. The bath towel is tucked over the edge of the cover, and exactly the same procedure is followed as that for the chest. After the back is wiped, the nurse may give the "pressure points" (scapulae, end of spine, and buttocks) a thorough rubbing. To massage the back the nurse applies both hands flexibly to the shoulders and rubs downward, one hand on each side, with a rotary, spiral movement, thoroughly rolling the flesh over the bone, and ending with especially thorough deep massage of the heavy muscles of the buttocks. In order to equalize pressure the nurse should form the habit of reversing hands, standing so as to use right and left hand alternately on each side, *i.e.*, she stands at the hips and rubs upward, then stands at the shoulders and rubs downward.

In hot weather a little talcum powder may be applied as a finishing touch. If the patient is old, helpless, or very thin, it is well to use alcohol or other astringent, pouring a little into the hollow of the palm of the hand when rubbing the back.

Care of the Back of a Helpless Patient.—In the case of a patient who cannot be turned the care of the back becomes an important and constant concern of the nurse. The bed under the patient

must be kept perfectly smooth and dry at all times and free from crumbs. To bathe the back the nurse tucks little cushions or pads under the shoulder and hip on one side to get space to slip her hand under as far as the spine. She takes a small, folded soft cloth in the palm of her hand, squeezed quite dry, since no moisture must reach the bed. She slips her hand, spread out with the flat wet cloth in it, under the shoulder, and carefully and thoroughly scours every inch of that side of the back from shoulder to hip. She wipes with a small soft towel wrapped flat over the hand, in the same thorough manner. She next pours a little alcohol into the palm of her hand and massages in a rotary manner as described, finishing with a little talcum powder. The nurse then duplicates the procedure on the other side.

Pads, cushions, and pressure rings should be so used as constantly to shift the weight of the body from place to place.

To Put on the Gown.—When the patient is wearing a long-sleeved nightgown or nightshirt it is put on in reverse order from that of removal. The arms are put into the sleeves, the garment is gathered up from hem to neck of the back and carried over the head without dragging it over the face. The gown is then drawn smoothly under the patient's body. (During the day a good nurse will occasionally draw down the gown under the patient. With restless or helpless patients this is important to comfort.) If one arm is lame put the sleeve on it first; then draw gown over the head and bend the well arm into the other sleeve.

The evening toilet should be made early in order that the patient may be free to drop asleep with the first drowsiness. The items may be enumerated as follows:

1. Take T. P. R. (see page 341).
2. Give bedpan.
3. Clean teeth, bathe face and hands.
4. Remove gown and massage neck and back.
5. Put on a fresh gown (two gowns may be alternated, the best one for day wear, an old one for night, giving an appearance and a feeling of freshness without unnecessary laundering).
6. Straighten bed, shake and turn pillow, arrange hair.
7. Give a hot drink and do whatever the condition of the patient requires in the way of treatment.
8. Arrange the bedside table with bell, fresh water, and handkerchief, wind watch, etc.

9. Remove flowers.
10. Arrange nurse's cot and supplies for night.
11. Adjust ventilation, heat, and light.
12. Maintain quiet.

Washing the Hair of a Bed Patient.—The nurse will require a pitcher of any preferred warm shampoo mixture, a pitcher of warm rinsing water, a cup of dilute lemon juice or vinegar (if desired), several soft towels, brush and comb.

A large bath towel is rolled in a long, compact roll and curved in the form of a horseshoe with the head (without a pillow) resting

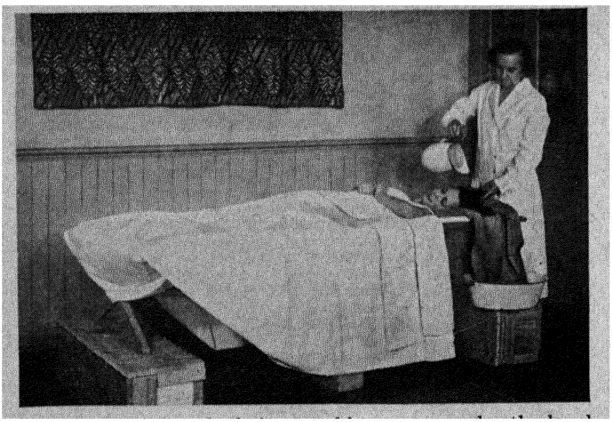


Fig. 99.—Washing the hair—a rubber apron under the head.

in the central space, the ends of the roll coming nearly to the edge of the mattress. A rubber sheet, the back of a raincoat (if not too stiff), or a rubber kitchen apron is draped over this and tucked under the roll in such a way that the head rests in the rubber basin, while the long end of the rubber square, the skirt of the raincoat, or the top of the apron forms a trough carrying the water into a pail, foot tub, or other large container placed on the floor at the edge of the bed (Fig. 99). Pledgets of cotton dipped in vaseline may be placed in the patient's ears, although it is possible, with care, to wash the hair without getting water in the ears.

After the usual sudsing and rinsing (three times) the rubber is withdrawn and a bath towel spread under the head while the hair is dried, the scalp massaged, and the hair arranged.

To Wash the Hair of a Child.—Lay the child on a table with a rolled bath towel under the neck, resting the towel on the very

edge of the table. Place a basin on a chair below the head (Fig. 100). In this position the hair may be freely sudsed and rinsed with the child in a comfortable position and without getting soap into the eyes.

Daily Schedule for Routine Care.—Every methodical person follows to some extent a daily schedule of work. At no time is this more important than in care of the sick. In general the following routine will meet the common needs of all bed patients,

FIG 100.—Washing a child's hair The child lies upon a table with a folded towel under the neck and with the head over the edge of the table.

although it may have to be adjusted to individual cases during critical periods of the illness. Always the specific treatments must be interpolated in the schedule in an orderly way. Most hospital-trained physicians will write orders so that they may be carried out with a minimum of disturbance to the patient. Such a physician will write them in 2- and 4-hour units or in 3- and 6-hour units. He will not order a prescription to be given every 3 hours and a gargle every 4 hours. He will be more apt to order the gargle every 3 hours, following the prescription. Many medicines are given before or after meals. Special treatments, such as enemas, douches, irrigations, or the dressing of wounds, may be carried out in the morning before giving the bath and making the bed. In other words, as many free and quiet intervals as possible should be obtained for the patient. Also the efficient grouping of procedures economizes the nurse's time and strength. For an ordinary case the routine will run somewhat as follows:

1. When patient awakens, give the bedpan for urination.
2. Take the T. P. R. (before anything is taken in the mouth).
3. Wash face and hands, tidy the hair, rinse the mouth with antiseptic (the teeth were thoroughly brushed at bedtime), give a drink of fresh water.
4. Make the bed tidy and the pillows comfortable.
5. Serve breakfast. (Nurse may eat if patient is able to feed herself; otherwise nurse eats when patient has finished.)
6. Give bedpan for bowel movement. (It is important to establish a regular time for this and have it over before the bath and toilet.)
7. Nurse assembles articles for the morning toilet, changing bed and cleaning room.
8. Bath and toilet.
9. Change bed.
10. Clean room dustlessly and noiselessly.
11. Bring in flowers, give water or nourishment, adjust pillows and light, and leave the patient to rest. Nurse may complete the record, rest, take a walk, or attend to other household duties.
12. At noon take T.P.R.
13. Serve noon meal.
14. Patient may rest, read, nap, or receive callers according to her condition.
15. At 4 P.M. take T. P. R., give bedpan, water or nourishment, etc.
16. Evening meal.
17. Evening toilet as described.

General Considerations in Nursing.

1. *The Attitude of the Home Nurse.*—When one is caring for a member of one's own family it is sometimes difficult to maintain even, tranquil, and impersonal behavior in the presence of the patient. It is highly important to do this from the standpoint of the patient's mental poise, and also because of the need of the nurse for conserving her own emotional and nervous strength and turning all her energy into service. She will, therefore, strive to be cheerful, neat, efficient, and professional to the utmost degree in her home sick room.

She will take the best possible care of her own strength, making it a point to eat sufficient food, even if she must force herself to drink milk to do so. She must seize every opportunity to relax and drop down and rest if only for a few minutes at a time. She should bathe, change shoes and stockings frequently, wear only comfortable shoes, change her clothing completely at night, and, in general, take extraordinary care of her body in order that her strength and nervous endurance may prove adequate for the need.

2. *The good nurse cultivates a firm yet flexible touch*, handling her patient with sureness and confidence and still with great gentleness. This is especially important with children and nervous patients.

3. *The good nurse has the gift of "vicariousness," i.e.*, the ability to put herself in her patient's place and see what is required without being asked. She will know when to offer the bedpan; give fresh water; adjust the light; add or remove covering, etc. The patient of a really good nurse seldom needs to ask for anything.

4. *The good nurse will conserve the nervous strength of her patient* by eliminating disturbing noises of every kind, such as creaking rocking chairs, creaking door hinges, tapping window shades, or noisy shoes. She will not bump the bed nor jar her patient, nor annoy her with jerking movements. An air of quiet efficiency should prevail.

5. The nurse who senses her responsibility for conserving the strength of the patient will tactfully *protect her from her friends.* In many cases solicitous friends have been the last straw that broke a sick person's reserve. In every illness of consequence the nurse should ask the doctor exactly how many callers and the duration of calls he considers permissible. The nurse may then say, without giving offense, that *the doctor forbids visitors.*

6. *The patient should not be disturbed at night.* In general a nurse will observe her patient frequently during the night and will be aware of her every need, but never, unless in an emergency or with special direction from the doctor, will she waken a sleeping patient for medicine or treatment. The sleep is usually more valuable than medication.

7. *The psychology of management* is sometimes important. In general it is better never to argue with or dominate an obstinate sick person of any age. A quiet statement of the situation with an attitude of firmly expecting compliance with the doctor's orders is often successful. Breaking the mood by telling a joke, or introducing some agreeable diversion, will sometimes work. The home nurse must be governed by her knowledge of the behavior pattern of the individual and she must try to use the methods which she has known to be most successful in inducing the refractory member of the family to do something she did not want to do.

*

CHAPTER XXIX

FURTHER SICK-ROOM CARE

Regular Elimination.—The bedpan or urinal should be presented to a bed patient with as much regularity as the meals. The frequency of urination necessary for comfort differs in individuals. The exact schedule will be learned by the nurse within a day or two. With most adults emptying the bladder every four to five hours is a habit. Urinating on awakening in the morning, the last thing at bed time, when the bowels move, and once or at most twice in between is usually quite sufficient for comfort. Children empty the bladder more frequently than adults.

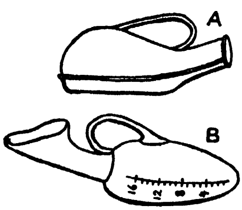


FIG. 101.—*A*, Male urinal; *B*, female urinal.

If the patient for any reason moves his body with difficulty, and using the bedpan is disturbing, a urinal should be used. For a woman a small oval vegetable dish works very well; for a man a glass fruit jar may be used. The regular hospital urinals (Fig. 101) are convenient but not essential.

The average American adult has one regular bowel movement daily. Many children and some adults have two or even three. It is highly important that regularity of elimination should be secured for the bed patient from the very day of going to bed. The logical and usual time for the first bowel movement is soon after the stomach begins to "churn" the first food taken in the morning. This peristaltic wave passes through the entire length of the bowel and should force the accumulated food residue in the sigmoid to enter the rectum, a procedure which should call for immediate evacuation (see page 61). The good home nurse will, accordingly, present the bedpan for the bowel movement ten or fifteen minutes after the patient has eaten breakfast.

Establishing Regularity.—The lethargy of the illness, the unaccustomed position and lack of exercise, and the nervous inhibition

many persons feel in using a bedpan for the first time, all may interfere with regular evacuation at the beginning of an illness, a time when the free elimination of waste is particularly important. In such cases most physicians will approve of the use of a small oil or soapsuds enema, or a soap suppository, for one or two mornings, until a regular habit is established (see page 308).

Care of the Genitals.—The fastidious care of the vulvar and anal regions is one of the responsibilities of a nurse. Toilet paper should be used after urination as well as after bowel movement. The parts should be bathed thoroughly and dried at the time of

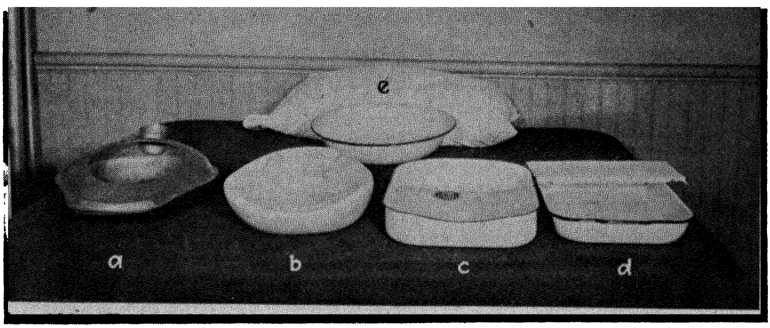


FIG. 102.—Types of bedpans: (*a*) slipper (aluminum); (*b*) perfection (porcelain); (*c*) douche pan (enamel); (*d*) improvised douche pan, (*e*) improvised bedpan.

the daily bath and at any other time necessary for perfect cleanliness and comfort. In some intestinal conditions, particularly the diarrheas of childhood, the acid fecal matter is irritating. After each evacuation the anal region should be gently bathed, patted dry, and covered with cold cream or other bland grease or salve to protect the tissues.

Bedpans.—There are several types of bedpans (Fig. 102), each of which may be purchased in aluminum, enamel, or porcelain. "The slipper pan" is easy to place under the hips; but it spills easily on account of its shallow edge, does not hold so much as the other types of pans, and is difficult to clean. The rectangular "douche pan" holds a maximum of fluid, is easy to clean, and fairly comfortable. The "perfection pan" is shaped to the body, holds a maximum amount of fluid, and is easily cleaned.

Two types of improvised pans are shown in Fig. 102. In case of an emergency a folded small pillow may be used to elevate the

hips and a hand basin crowded against the pillow until the edge clears the anal opening. A satisfactory bedpan or douche pan may be improvised by wrapping a towel about a shingle or small board and placing it across the end of a large baking pan.

A bedside commode is sometimes a necessity during convalescence or in chronic illness. A very satisfactory commode can be constructed from a packing box (Fig. 103).

Presenting the Bedpan.—Bedpans and urinals should be kept scrupulously clean. The nurse should keep a towel or other square of cloth for throwing over the bedpan or urinal in carrying it to and from the bathroom.

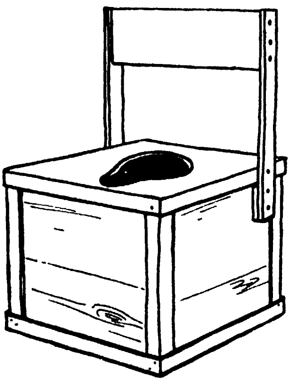


Fig. 103.—An improvised bedside commode with proper back rest.

When presenting the bedpan to a patient the knees of the sick person are flexed, the gown brought up out of the way. The pan is held in the left hand of the nurse while with her right hand she raises the covers slightly on the left side of patient and, if necessary, helps the patient with her right hand to raise the hips while the pan is slipped under them. It is not necessary to expose the patient during the use of the bedpan. Lift the covers on the left, and when the pan is removed give all necessary assistance in the use of toilet paper and bathing the parts.

In cold weather the pan should be warmed. The portion which comes in contact with the hips should always be covered with a folded towel. With sweating patients, or patients who are in a weakened, prostrated condition, the pan should always be warmed and covered no matter how warm the weather.

Enemas.—The term enema (from Greek *eniemi*, to send in) is applied to the introduction of fluid into the bowel. Enemas are used (1) to induce the emptying of the bowel; (2) to introduce nutriment; (3) to introduce medicine; (4) to introduce water to be retained. A fountain syringe or irrigation can operating by gravity is commonly available. Piston syringes and bulb syringes are now seldom used, as the pressure is better controlled in gravity types of apparatus and they are therefore believed to be better.

A rectal or colon tube attached to a funnel is preferred for giving medicine or food to be retained. The fountain syringe or irrigation can is equipped with a long rubber tube, a stopcock, and a set of hard-rubber tips. There usually are three tips: a small child's size, an adult size for use in the rectum, and a large curved tip with a corrugated bulbous end, designed for use in giving vaginal douches (Fig. 104).

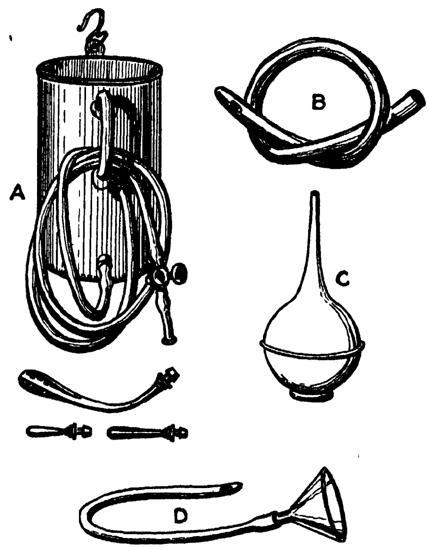


Fig. 104.—Types of apparatus for giving irrigations and enemas. *A*, irrigating can with hard rubber tips; *B*, colon tube; *C*, rubber infant syringe, *D*, soft-rubber catheter and funnel.

The soft-rubber colon tube is about 15 inches long, having a rounded closed end with the opening on the side. The closed end prevents stoppage of the opening by contact with fecal matter or with the loose mucous lining of the bowel.

A soft-rubber bladder catheter, an instrument used to withdraw urine from the bladder, is often used as a colon tube for infants. Rubber catheters are made in various sizes from scarcely larger than a knitting needle to as large as a lead pencil. Except in size they are exactly similar to the colon tube. With either colon tube or catheter a funnel of appropriate size is fitted into the open end. This apparatus is used when a small amount of fluid medicine or nourishment is to be introduced. When it is desir-

able to introduce larger amounts to be retained the open end of the colon tube is slipped over the hard-rubber tip on the end of the long rubber tube, or a section of glass tubing may be used as a connection.

With infants a soft-rubber bulb may be used. The conventional "infant syringe" consists of a bulb with a small hard-rubber tip. Some physicians like better the soft-rubber ear syringe, which has a flexible nozzle or tip.

The Cleansing or Evacuant Enema.—Although a variety of solutions are used with differing temperature, force, etc., according to the preference of the physician, the nurse, if left to her own judgment, will use a mild, unirritating solution, at body temperature, and administer without force.

In considering the technique of giving enemas it will be necessary to have in mind the structure of the parts. On page 57 is a diagram of the intestinal tract from which it will be seen that the most advantageous position for receiving the enema is on the left side, since the rectum bends toward the left in joining the sigmoid flexure. The internal structure of the rectum is shown in Fig. 61. The rectum is a highly specialized organ whose function is to expel, by vigorous peristaltic action of its vertical, circular, and spiral involuntary muscles, anything and everything entering it. At the exterior opening of the rectum is a band of fibers called the sphincter which is under the control of the will to a marked extent in the adult but not at all in the infant, control being gradually acquired in the child. The rectum has a highly sensitive lining richly supplied with both blood vessels and nerves. Nothing should ever be done which may inpair the functioning of this delicate structure (see page 62).

The nurse will have choice between mild soapsuds, the most usual solution, or normal salt solution (1 level teaspoonful to a pint of water). She will prepare a quart of solution at slightly above body temperature or 100° to 105°, place it in the enema can or fountain syringe, and hang it slightly above the level of the patient's body. Figure 105 shows a fountain syringe hung from an extemporized support consisting of a mop stick tied to the corner post of the bed. The nurse will then prepare her patient by placing a towel or rubber square under the hips; turn her on the left side, if possible; if not leave her on the back. She has

the bedpan at hand, also toilet paper, lubricant, etc. She will now open the stopcock and let the cold air and cold solution run out of the tube.

When the tube feels warm she shuts the stopcock, introduces the oiled tip, and pinches the tube while she opens the clamp. She releases the pressure gradually. The first impact of the fluid may cause a peristaltic reaction, and the patient may quickly say she can retain no more. If the nurse pinches the tube and attracts the patient's attention to something else for a few

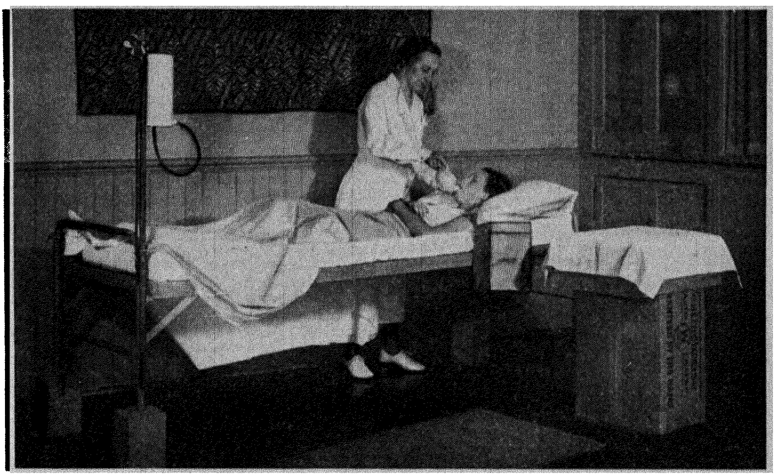


FIG. 105.—Shows irrigation can hung from mop stick, drinking from a small tea pot; knees raised upon a rolled pillow; grocery sack pinned to side of mattress.

minutes, then slowly releases the tube, she will usually find that the bowel will accept a large amount of bland fluid without further protest.

The colon tube should be introduced with a slightly twisting or corckscrew movement to prevent the end's going into one of the pocketlike pouches of the rectum above the valves of Houston (see Fig. 61). There should be no more force applied than the weight of the end of the finger. The utmost gentleness should be used with organic structures of every sort.

When all the fluid has been introduced which the patient can take with comfort the tip is withdrawn and the towel held over the anal opening while the patient is placed on the bedpan. She

is encouraged to retain the fluid as long as comfortable, as the feces are thus thoroughly softened and the results are more complete. The character of the movement should be entered on the bedside record.

Nutrient and medicated enemas are given with colon tube and funnel. An evacuant enema is always given first and the patient rests until all peristalsis has ceased. The oiled tube is introduced with twisting movement far enough to clear the sensitive part of the rectum, pass the internal valve and enter the sigmoid. This is essential to absorption. The solution, which will always be prescribed by the physician, is slowly poured into the funnel. The patient should lie quiet and relaxed for a time.

The oil enema is used with infants, and with adults having obstinate constipation, and accumulated, hard, fecal impaction of the colon. The oil enema is given exactly as is a nutrient enema and also follows a cleansing or evacuant enema. With a small child a catheter or rubber bulb is employed. From 6 to 16 ounces of oil is used, which is warmed by standing the container in warm water. Any bland salad oil or refined cottonseed oil is suitable. After introducing the oil the patient is encouraged to be quiet and retain the oil indefinitely. When given at bedtime it is frequently retained all night, thus thoroughly softening the contents of the colon and producing thorough emptying in the morning. The oil has the great advantage of being nonirritating and hence is not habit-forming as is almost every other medicament for producing bowel action.

Giving Water to Be Retained.—In Chap. XII we learned of the extreme importance of maintaining the blood volume and water balance of the body. Numerous conditions arise which make it impossible to take or absorb water through the ordinary channels of drinking. Injuries or infections of the throat may interfere with swallowing. Extreme nausea following operations or in certain diseases may make it impossible to retain water. In great loss of fluid through hemorrhage, excessive vomiting, or protracted watery diarrhea, in extreme toxemia, in acute appendicitis—in any of these situations it may be necessary to introduce water by bowel, intermuscularly, or intravenously. The technique of giving water by bowel to be retained is quite simple. In hospitals a very precise apparatus with thermostatic control is

now commonly used. In the home the ordinary apparatus described in this chapter will suffice. If the colon is not already empty, and if the condition of the patient will permit, a cleansing enema should first be given, followed by a period of rest.

Normal salt solution is then prepared and regulated at about 105° to allow for some cooling as the water passes through the tube. Additional solution at this temperature should be added from time to time.

The container should be filled and hung just above the level of the body. The cold air and fluid should be run out of the tube, then tooth picks or matches inserted between the clamp and the tube until the water drips but does not flow from the tube end. The colon tube is then attached, oiled, and inserted as far as the sigmoid flexure. The patient is placed in a comfortable position, and the tube remains in place sometimes for hours. The bowel takes up the water as it drips; the blood pressure rises; thirst is quenched; toxins are diluted; the patient's condition improves, and often extreme discomfort is relieved.

Irrigations and Douches.—An irrigation is the direction of a stream of water into a cavity or against a surface without force. A douche is the use of a stream of water directed from a sufficient height or distance to create pressure or force. Irrigations are used to wash away secretions or foreign matter, to convey antiseptics or other medicinal substances, and to secure the effect of heat or of cold. Douches are used for similar purposes plus the stimulus of pressure.

The two terms, irrigation and douche, are carelessly and interchangeably used, and it has become usual to refer to a "vaginal douche" when one means a "vaginal irrigation," since force is practically never used in introducing fluids into the vagina.

The home nurse may be asked to give irrigations to the throat, the ear, the vagina, or to a suppurating wound. She may have to assist in irrigating the bladder, but will not be expected to assume the responsibility for such a delicate and technical procedure. She will seldom be called upon to give douches, and the doctor will give explicit directions in particular situations in which douches may be indicated.

The preparation for giving an irrigation is the same as for giving an enema except that everything must be carefully sterilized by

boiling. The fluid prescribed is placed in the fountain syringe or irrigating can with the tube and tip attached. The fluid is at the temperature ordered and the container hung as directed for the enema. A large receptacle is necessary for receiving the fluid.

For irrigation of the throat the patient may, if able, lie across the bed face down with the head above a basin. She may hold the tip and direct the stream against the back of the throat. This position avoids all strangling or choking. If unable to do this she may be raised on pillows with a large basin placed as for cleaning the teeth or, if she is able to sit up, held on her lap. The nurse will hold the tube and direct the flow, taking great care to permit the patient to breathe and not to tickle the soft palate with the tip. Throat irrigations are used to reduce swelling and pain in certain infections.

Irrigation of the vagina is frequently necessary after miscarriage or in treating any infection of the generative tract. The douche tip (Fig. 105*A*) is used, which is closed at the end and is curved to fit the vaginal canal. Reference to Fig. 61 will show the location of the cul-de-sac (blind pouch) behind the cervix. In order to be effective the antiseptic fluid should circulate freely in this area. It will be noted that the uterus opens into the vagina. There is danger of infective material being forced from the vagina into the uterus if force is used in giving an irrigation; hence the end of the vaginal tip is closed and the irrigating can is hung just above the level of the body. Large amounts of fluid must be used to be effective.

The external parts should be wiped with a pledget of gauze or cotton dipped in antiseptic. The vaginal tip should have been boiled, and the portion to enter the vagina should not be touched. The greatest care should be taken to avoid introducing infective matter into any body cavity.

Irrigation of the ear is accomplished by holding a basin under the ear and introducing the fluid with no force whatever.

In irrigating a wound discharges may be removed while the irrigating fluid is playing upon the surface, by swabbing with pledgets of cotton held in the splinter forceps. Unless directed otherwise by the physician the home nurse will have the fluid at body temperature and will use no force.

If necessary for the home nurse to catheterize a patient, as may be the case in certain chronic diseases, the physician will always demonstrate the technique. The most scrupulous care must be taken that everything is absolutely sterile. Catheter and cotton pledgets must be sterile and the region of the urethral opening wiped with antiseptic before introduction of the catheter.

CHAPTER XXX

BATHS, THE USE OF HEAT AND COLD

Therapeutic Baths.—Remembering the importance of fluids within the body we find it natural that the exposure of the exterior of the body to fluids of different temperatures may have definite effects of varying sorts. These effects are accentuated in illness and bodily disorder. The role and technic of the daily bath have been discussed in Chap. XXVIII. In the nursing of the sick it frequently becomes necessary to use baths and other methods of applying water for therapeutic purposes. A few of those most commonly employed will here be described.

The Temperature-reducing Bath.—While drastic methods of bringing down the temperature in fevers are not so often employed as formerly, it does become necessary, in certain cases, rapidly to reduce a dangerously high temperature. The doctor will usually give minute instructions as to how he wishes this done. If the technic is left to the nurse she will proceed somewhat as follows, remembering that certain points must be borne in mind in any and every treatment designed either to raise or to lower body temperature.

1. The head must be kept cool and the feet warm. It is dangerous and makes the patient exceedingly uncomfortable to reverse this relation in any degree.
2. The patient must have an abundance of fluids to drink. She may have hot or cold drinks, flavored beverages, or plain water, whatever she prefers and can take in largest amount, usually plain cool or cold water is most acceptable.
3. There must be no shock. If at any time there is shivering, blueness of the skin, or sign of prostration, the bath must be quickly terminated (no matter what the orders as to duration and temperature), the body dried and covered, and the situation reported to the doctor.

Reducing Temperature by Sponging.—The simplest method of forcing down temperature is with the continuous sponging of the body. The steps in the procedure are as follows:

1. Bring a basin of tepid water and a pitcher of cold water; another pitcher of drinking water with cup or drinking tube; a large wash cloth and a supply of towels; a piece of ice in a cloth.

2. Remove gown, spread a towel over the abdomen and genitals, place a cotton blanket under the body and a rubber apron or other protection covered with a towel under the head. The head should be at whatever height is agreeable to the patient.

3. Wring a soft towel out of ice water and apply turbanwise to the head. If the feet are the least bit cool apply a hot-water bag to the feet. During the course of the bath the nurse will frequently rub the ice over the turban and feel the feet of the patient, applying heat at any time it becomes necessary.

4. Squeeze the wash cloth from the tepid water, leaving it as wet as it can be without dripping (Fig. 95); bathe the face, chest, arms, legs, back. Do not wipe, as it is the evaporation which reduces the temperature. If the patient is very ill it may be inadvisable to turn her in order to bathe the back as often as the other parts of the body. The back should be sponged at least at the beginning and at the end of the bath. The nurse quietly goes over and over the body as described, frequently adding a little cold water to the basin, until the time indicated by the physician has expired.

5. Every few minutes the nurse should give the patient as much water as she will drink.

6. When the bath is ended the body is quickly dried without friction, the gown and bed put in order, the paraphernalia removed, and the patient left to rest.

7. The temperature should be taken at the beginning and at the end of the bath, and every 30 minutes thereafter, until it becomes evident that the temperature is stationary. The temperature sometimes continues to fall after the bath is ended; sometimes the fall produced by the bath is very transient and the temperature will soon begin to rise, in which case it may be necessary to repeat the bath, using somewhat colder water.

The Alcohol Fan.—Instead of applying water to secure evaporation a very simple, speedy method is sometimes used, in which the nurse wets the body with alcohol applied with the bare hand or with a flat piece of gauze. She then fans the surface gently and evenly, with long, slow movement from head to feet of the patient, taking care not to chill any spots.

The Temperature-reducing Tub Bath. With children who can be carried to the tub, this method of reducing temperature is sometimes preferred.

1. The tub is filled with tepid water; a head rest is arranged (Fig. 106); drinking water, towels, etc., are at hand.

2. The cold wet turban is applied to the head; the child is laid in the tub with the head supported, and a towel placed over the genitals and abdomen.

A portion of the body always floats above the water; it is necessary to cover this in order to have the exposed portion experience the temperature-reducing effect.

3. The nurse sets the cold water faucet to drip, thus gradually cooling the bath. She must then continually mix the water by trailing her hand about the edge of the tub (Fig. 106). The patient's head must be kept cool, and drinking water must be given every few minutes. The arms and legs should be gently manipulated and rubbed to bring more blood to the surface to be cooled. Two attendants should be provided if possible

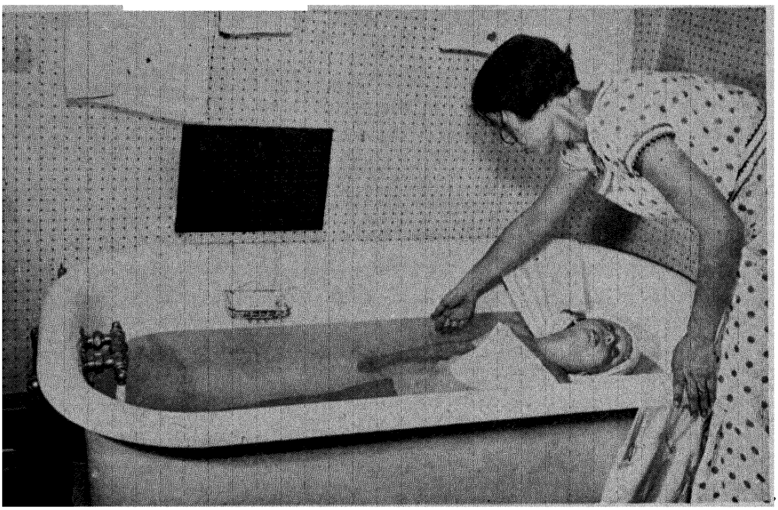


FIG. 106.—Giving a temperature reducing tub bath. The child's head, wrapped in a cold wet turban, rests in a hammock made from a folded sheet pinned around the tub. The mother keeps her hand going round the edge of the tub while the cold water trickles in, thus gradually cooling the bath.

4. On termination drain the water, wrap the child in a dry sheet, dry gently, and return to bed, taking the temperature as directed for the sponge bath.

The Hot Bath.—In some conditions of toxemia it may be necessary to produce sweating by exposing the body to prolonged heat. Exactly the same technic is employed as for the cold bath, including cold turban, drinking water, etc., except that the hot-water faucet is opened slightly and the temperature of the water is gradually raised to the highest point of comfort and toleration. In any exposure to heat the reaction of the body will show in the sweating of the face. The face should be frequently wiped with a soft towel.

When returned to the bed the body should be carefully protected from exposure to chill. The head should be kept cool and the temperature watched.

The Neutral Bath.—In modern institutions for the care of nervous disorders more or less elaborate equipment will be found for giving prolonged neutral baths. It has been found that lying in water of body temperature has a tranquilizing effect upon an overactive nervous system. The prolonged neutral bath is used in the treatment of intractable insomnia, nervous irritability, mental excitability, etc. The neutral bath can be successfully administered in the home in the ordinary bathroom by the resourceful home nurse.

1. The tub is filled full enough to float the body; the temperature of the water is kept at about 95°–97°F. This is accomplished by occasionally trickling in hot water as described for other baths.
2. The body is placed at rest with the head supported and the torso covered. Unless especially indicated the turban need not be used, although the application of merely cool water in this manner may reinforce the action of the bath. Covering the entire tub with a blanket or sheet retards the cooling of the water.
3. The eyes should be protected from direct light, extreme quiet should prevail, and the room should be so arranged that there will be no confusion or activity when the patient is returned to his bed.

The effect of the bath is to stimulate the kidneys. Therefore, the patient should empty the bladder before entering the bath.

The physiological effect of the neutral bath upon cell chemistry is not well understood. The protection of the oversensitive nerve endings from the friction of clothing, exposure to varying air temperatures, etc., is one factor. The chemical effect of interruption of surface evaporation from the sweat glands may be a factor. Whatever the explanation the neutral bath seems to have a definite place in therapeutic procedure.

Other Uses of Heat and Cold.—Dry heat may be applied by any of the variety of apparatus described on page 318 (Fig. 107). Certain items may be mentioned which should be borne in mind.

1. For local effect the appliance should be soft, flexible, and not too heavy. A hot-water bag should be not over half or two-thirds full and should have the air expelled as the stopper is screwed in (Fig. 108). Sand or salt bags should not be too full to be flexible (Fig. 107).

2. No rubber appliance should ever be placed next to the skin. Whether hot or cold there should be a layer of cloth between the rubber and the skin; hence all rubber bags should be placed in fitted covers or wrapped in towels before applied.

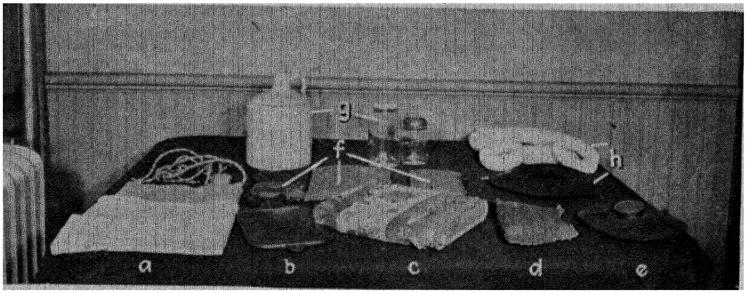


FIG. 107.—Apparatus for applying heat or cold. *a*, electric pad; *b*, hot-water bag; *c*, galvanized refrigerator can; *d*, section of inner tube; *e*, rubber ice bag; *f*, canvas bags for salt and sand; *g*, stone jug and fruit jars; *h*, doughnut rings and rubber hip ring.

FIG. 108.—Expelling the air while screwing in the stopper.

3. No hot object should ever be placed near the body of a sleeping, delirious, stupid, or unconscious person. Very deep burns may result from the continued pressure of a heated article which may feel quite tolerable to the hand of the nurse. The bed for a patient returning from the operating table, or for a person suffering from shock or chill, should be thoroughly warmed by placing a number of hot objects in it, but these should be removed before placing the patient in the bed.

4 The nurse should test any object used for warming the feet, or any other part of the body, by holding it for a full minute or more against the inner surface of her arm at the elbow, or against her cheek.

The Dry Hot Pack.—In some toxic conditions where elimination by sweating is to be forced the dry hot pack is used. The patient should be stripped, a cold turban applied, a sheet wrapped loosely about the body and tucked in about the neck and arms and

between the legs. Over this a blanket should be tucked closely about the body. Then hot objects such as fruit jars, bricks, hot-water bags, electric pads, etc. are placed about the body outside of the blanket, taking care that they are not too hot. Other blankets are placed over this arrangement. The turban must be kept cold; the face must be wiped and water given as described for other baths (pages 314–315).

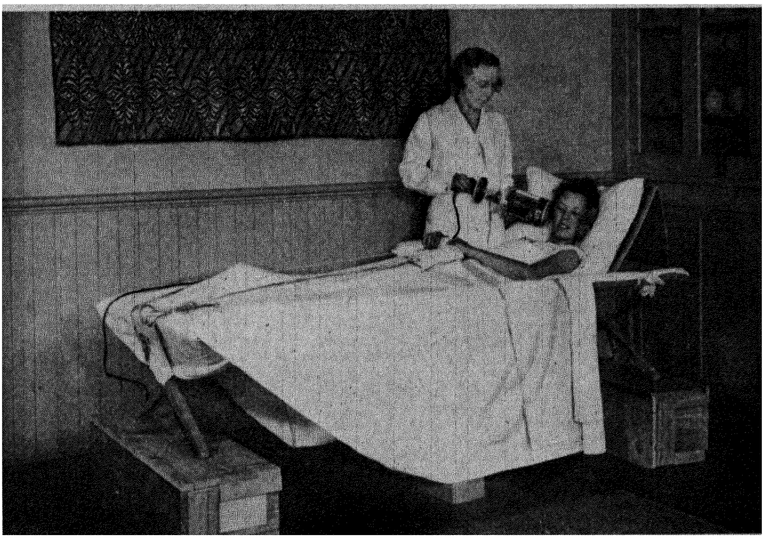


FIG. 109.—Applying heat to the right ear. A light bulb is being fixed in the cover of a paper cereal box with the bottom removed. A rubber bathing cap filled with crushed ice is shown covering the left ear.

A rope with the loop wrapped in a towel is tied to the lower corners of the bed to enable the patient to pull herself up and change her position. A corrugated box serves as a back rest.

The hot or cold wet pack is administered as described for the dry pack except that the sheet is wrung from hot or cold water as the case may be, and the appliances outside the blanket are hot or cold according to orders.

Electric heat is very penetrating and effective and may be prescribed in home treatment. A light bulb with an extension cord may be fitted into the lid of a bottomless paper cereal can and applied to the ear or to a small spot of infection (Fig. 109). Several such bulbs may be attached to extension cords through small circular openings in a corrugated box having two sides cut

away. This makes an effective light bath for a knee, the abdomen, etc. (Fig. 110).

Commercial lamps for both ultraviolet and infrared rays are extensively offered for sale. Some are quite worthless and some are too powerful for inexpert use. The advice of a physician should always be followed in purchasing such a lamp and in its use.

The hot wet compress is one of the most effective measures for relieving pain or reducing swelling, or hastening the "coming to a

FIG. 110.—Applying heat from light bulbs with extension cords attached to inside of a cutout corrugated box.

head" of a local infection. For a small area, such as the eye, or a boil, a folded Turkish wash cloth is convenient. The folded compress is placed in the center of a small towel which is spread, hammockwise, over a basin of boiling water. The nurse wrings the dry ends of the towel in opposite directions (Fig. 111); she takes the two ends in her left hand while she uncovers the site of application with her right hand. She opens the towel and picks up the compress by two corners and eases it down with great care not to burn. She then covers the compress with a folded towel. As soon as the patient says the compress no longer feels hot she prepares a second one in an exactly similar manner and brings it to the patient before removing the first one.

If the area is not sensitive to weight, the effect of the compress may be reinforced by applying a hot-water bag (*never* an electric pad, as dampness will short-circuit the current; see page 425) over the compress, which will then not need changing so often.

A large compress may be used on the abdomen, knee, or hip. Turkish bath towels are convenient for this. If the compress is not too large a canvas "stupe wringer," having sticks run through the hems, may be used (Fig. 112). For extensive application to

FIG. 111.—Wringing small compress in a dry towel.

FIG. 112.—Wringing large compress with stupe wringer.

the body, as in violent chills (see page 322) large towels may be wrung from a tub of hot water through a clothes wringer.

Compresses may be medicated, as when turpentine is added to the water in treating extreme gas distention in typhoid. Salt or soda compresses may be used as first aid in the treatment of burns. Alcohol, magnesium sulphate, or potassium permanganate may be added to the water for application to eruptive surfaces, as in ivy poisoning, smallpox, etc. Such a compress is bound in place with a loosely applied bandage and is kept wet by pouring small amounts of solution under the edges of the bandage.

For simple eyestrain one compress may be applied to both eyes. If any infection is present two basins and two sets of compresses should be used, and nothing should touch one eye which has touched the other.

Cold compresses are applied in manner exactly similar to hot compresses except that they are wrung out of ice water.

Counterirritants are irritating applications which withdraw the blood supply from the site of trouble and thus relieve pain or congestion. There are now many "hot greases" on the market which may be purchased in tubes and rubbed on the offending spot. Much less use is now made than formerly of homemade counterirritants. In an emergency mustard may be used in any of the traditional ways. A mustard poultice is made by mixing a teaspoon to a tablespoon of fresh mustard (according to the sensitiveness of the site and intensity of the pain) with a small amount of flour-and-water dough. This is spread upon a cloth and the edges turned in all round to hold the paste. The surface of the skin is greased to make blistering less likely. The poultice is applied and covered and left until the skin is definitely reddened. Great care should be taken not to leave the poultice in place too long, as deep and lasting blistering and destruction of tissue may result. Country people sometimes use bruised horseradish leaves as a counterirritant instead of mustard, with similar effect.

Mustard is sometimes added to resuscitating baths for shock or convulsions. It is doubtful if this should ever be done with children, whose skins are highly sensitive and who may experience lasting discomfort.

Turpentine is highly volatile, strongly antiseptic, and apt to be available in emergency. A few drops may be added to hot compresses where counterirritant effect is desired. Great care should be used to prevent blistering; the surface should be greased and the solution should be weak.

Unirritating poultices may be used in emergencies to relieve pain or reduce swelling, but it is doubtful if they have any virtue above that of hot or cold wet compresses. The laity have traditionally used hot pastes of bread and milk, salt pork, baked potato, flaxseed, etc., but all are "messy" and without specific virtue.

CHAPTER XXXI

FEEDING THE SICK

The duty of the nurse is usually, first of all, to provide her patient with a "balanced ration" in order that the body may function with full vigor in its effort to restore itself to normal state (see Chap. VII). It is of the utmost importance that the home nurse understand the fundamentals of nutrition and dietetic balance no matter what or how serious the illness. In the second place it will be her duty to carry out with great exactness any order of the physician as to special deviations from the regular balanced diet which the chemical condition of the body may make necessary. In diabetes, for example, it may be necessary to compute by exact weight the amount of carbohydrate in the patient's food. In some types of nephritis it may be necessary to give a diet free from salt. The ketogenic diet (high fat, low carbohydrate) now frequently used in epilepsy requires exact knowledge of food composition.

In general no lay person, sick or well, should ever experiment with diet. Experience shows that a generous balanced ration tends to keep the individual at his highest level of health and vigor. Deviations from the balanced diet should be undertaken only under advice from a professional nutritional specialist. The chief difficulty in feeding the sick is in securing cooperation and maintaining interest in eating.

Although every meal should be balanced and the food presented during every 24-hour period should total the number of calories designated by the physician as desirable, too much should not be presented at one time, as that in itself may lessen the zest for food.

The general balanced diet may be selected from regular, light, or liquid foods.

The regular tray may contain anything which appears upon a well-balanced family table except that foods difficult or slow of digestion will be avoided. As a rule no fried foods, rich pastries,

or tough or fibrous meats such as hamburger steak, sausage, etc., will be served to a bed patient.

The light diet will include milk and milk dishes, eggs in many forms, a little choice, tender meat, fowl, or sea food, choice, delicately prepared vegetables, nutritious soups, fruits and fruit juices, and, usually, light desserts.

Liquid diet presents some difficulty in securing balance and variety with a full caloric value. Two to four pints of milk in various forms furnishes the basis of the liquid diet. Vitamins, minerals, and variety must be provided in fruit juices, vegetable purées, egg yolk, and cereal gruels. Liquid diet must be given every 2 to 3 hours, since it is undesirable to distend the stomach with a large amount of fluid at one time.[1]

As a rule no patient is awakened at night for either medicine or food, but food should be presented to the patient on liquid diet when she happens to waken during the night.

Ways of Serving Milk.—The proverbial "quart of milk per day" may become exceedingly monotonous, especially when the appetite is not very keen. How to get a child or an adult who is not intellectually interested in the situation actually to consume four or more glasses of milk will tax the resources of any home nurse. Fortunately there are many ways of changing taste and appearance and making variety possible even in liquid diet. Milk as a beverage may be served iced. The tinkling of the ice may appeal to a thirsty, feverish child or adult, especially if the drink is served in an attractive tall glass, perhaps with soda-fountain straws. Buttermilk and lactic acid milk are often relished, especially in fevers.

Milk beaten with enough melted gelatin to keep it soft, and with or without flavoring, may be frozen in an electric refrigerator. A little whipped cream and a few drops of fruit coloring may make milk acceptable, especially if it is permissible to use a little sugar and vanilla with it. It is bad practice, however, to

[1] It is a good exercise to make up several daily dietaries for a patient on light diet; also for a patient on liquid diet. Compute the total calories, also the protein, fat, and carbohydrate calories and the percentage each bears to the total calories. The mineral and vitamin content and acid-base balance should be carefully estimated according to the forms presented in some recent text on foods.

sweeten food unnecessarily or to create a demand for sweet food (see page 74). Therefore the home nurse should use sweetened preparations of milk only at regular intervals and not too often, perhaps at the end of the day as a special treat. Used in this way simple egg custards, junket, and frozen custards are usually permitted. Ice cream is always popular and provides many calories. Its high fat and sugar content must be considered in reckoning the dietetic balance.

Cocoa and chocolate drinks, hot or cold, may be used occasionally for variety, but may interfere with the child's liking for other foods if given often. Egg and milk beaten together with a little sugar and flavoring give a high food value for the digestive effort. The white may be beaten stiff and colored with fruit juice before adding. Plain hot milk may be flavored by pouring it over browned toast and adding a little salt and butter. If permitted by the doctor, a little peanut butter added to very hot milk may be tempting. Flavored gelatin or jello made up with hot milk instead of water will provide a variety.

Vegetable purées are important and usually should be served at least once daily to any patient on liquid diet. In making purées, green leafy vegetables and tomatoes are particularly valuable on account of their minerals and vitamins. A mixture of vegetables cooked down in water with any desired meat stock and strained provides a clear soup which is appetizing and which supplies important vitamins and minerals. A cup of this may well be served hot once daily. Meat broths are appetizing but not very nourishing. With the addition of vegetable juice, milk, and thickening or jellied with gelatin they have a distinct place and value in feeding the sick.

Gruels made with milk or to which milk or cream is added are often allowed in a fluid diet. Whole-grain cereals have more food value than milled grains, and should be cooked long enough thoroughly to release the food principles from the grain, then rubbed through a fine sieve. For an occasional change of flavor, crackers may be moistened with heated whole milk and then put through a sieve, although it must be remembered that the whole grain has the highest value.

Fruit juices are indispensable in the balanced fluid diet and should be served twice or oftener daily. Where a smooth diet is

ordered all fruit juices should be strained. They may be served hot or cold, plain or sweetened slightly, or with beaten white of egg (albuminized).

Orange juice is, perhaps, the most valuable, and a full glass (8 oz.) should be given once daily. One other full glass of fruit juice (less for a small child) may be given later in the day, and may be selected from a wide range in order to provide variety and surprise—grape juice, lemonade, pineapple juice, fresh cider, grapefruit juice, limeade, cherry juice, etc. A little lemon juice may be added to other juices to increase the vitamin C content. A small amount of the syrup from canned fruits may be added to fresh fruit juices, or to gelatin.

In general the quart of milk should be distributed throughout the day in different forms for each day. This will provide approximately 700 calories. Two glasses of unsweetened fruit juice will add about 200 calories. According to the age and condition of the patient 600 to 1,000 additional calories must be provided in one or more eggs (1 egg yolk, about 50 to 60 calories; 1 white, 15 to 20 calories), in cereals used in gruel (4 soda crackers, 100 calories; cooked whole cereals, about 100 calories to ¾ cup); sugar and butter each add 100 calories for each level tablespoonful added. Cream adds 100 calories for each ¼ cup of thin cream, 1½ tablespoons of thick cream, or 1 heaping tablespoon of whipped cream. Vegetables used in purées and soups will not add greatly to the calories; neither will the meat stock, except for the fat content, which can be roughly estimated. Chocolate is high in fat, and 50 calories must be reckoned for each tablespoonful used; 40 calories for the same amount of cocoa. It will be seen that it may be necessary to add a good deal to the milk quotient if a high calorie diet is prescribed by the physician.

The psychology of feeding invalids, especially children, may enter largely into one's success in supporting strength and promoting recovery. The home nurse must constantly bear in mind the importance of variety, surprise, attractive appearance, and catering in every legitimate way to individual taste. Various devices may be tried with children to make the meal interesting. A picture or a verse lightly pasted to the bottom of a glass of milk, so that it cannot be seen till the milk is drunk, may work for

a few times. Telling the story of *Grain through the Ages*[1] may increase interest in cereals; the story of dairying in Holland or the history of milk,[2] may arouse interest in milk. Urging and bribing defeat their objective and are poor psychology. If a child (or adult) refuses with obvious aversion an article of food presented to him remove it without comment, substituting something of equivalent value if possible. Diverting attention and interest is better than arguing or urging. If a patient takes only a small amount of food he must be fed oftener. Usually this fact

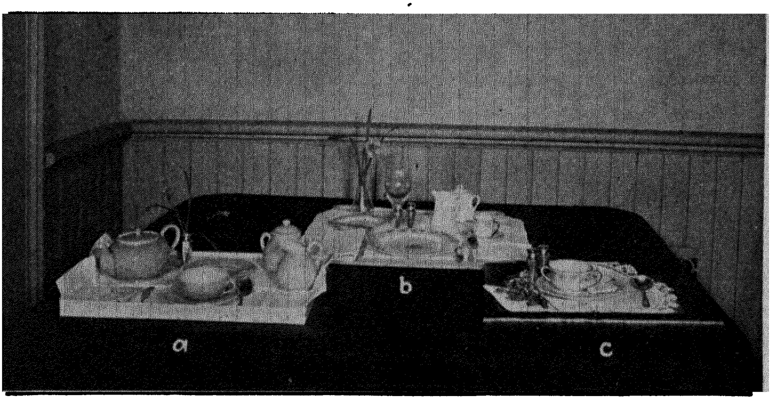


FIG. 113.—Improvised trays. (*a*) A box lid, (*b*) the burner tray from a gas stove; (*c*) a framed picture.

should not be brought to his attention, as he may react negatively to the idea of frequent feeding.

Serving meals on time is important, since the patient may "get all out of the notion of eating" if the meal is delayed. Regular eating is important for the well—it is doubly important for the sick.

Orderly service adds much to the pleasure in eating. The nurse should adjust the pillows and prepare the tray table before bringing in the tray (Figs. 113 and 114). The tray should present a fresh and attractive appearance. It should be set as for a formal

[1] HALLOCK, GRACE T., *Grain through the Ages, Hob O' the Mill*, and *Travels of a Rolled Oat*, Quaker Oats Company, Chicago.

[2] CARRUTHERS, ZILPHA, *The Path of the Gopatis* [The Lord of the Cow] The American Dairy Council, 910 South Michigan Ave., Chicago.

meal, with pretty dishes, bright silver, and always a flower or other decoration.

Serve promptly after dishing up the food. Hot drinks must be brought in a closed tea, coffee, or chocolate pot. It is impossible to pour a drink into a cup, carry it to the patient and have it hot by the time the patient drinks it. Soups should be poured, boiling hot, at the very moment of serving. Cold or frozen deserts should be brought when the patient is ready for them. Salads should be cold and crisp.

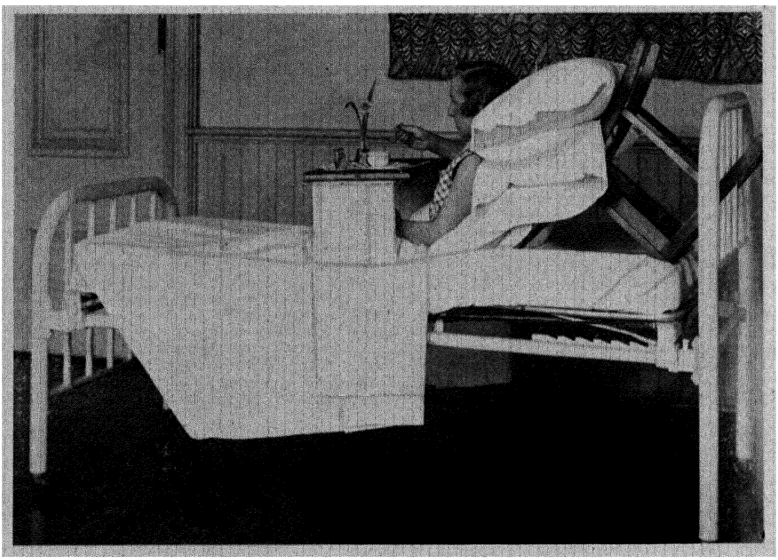


FIG. 114.—Improvised back rest, tray table, and tray.

Be certain that nothing is forgotten. It is very disappointing to have to wait for salt, sugar, or silver.

Remove the tray as soon as patient has finished. It is fatiguing to have to look at a used tray and be unable to relax and rest after eating.

Feeding Helpless Patients.—If the nurse must actually put the food in the patient's mouth she should assemble everything needed, seat herself conveniently, place a napkin over the patient's chest, and raise the head as much as allowable. Bread should be buttered and cut into small cubes, meat into bites, etc., before bringing in the tray, and both should be served with a fork.

Semisolid food should be served with fork or teaspoon. Fluids may be drunk through a tube or straw or from the spout of a small pitcher. The patient should eat leisurely and the nurse must alternate the various items offered. She must be deft and careful in introducing the spoon into the patient's mouth, and wipe the lips if touched with food. Cheerful conversation may add to the enjoyment of the meal. In feeding a seriously prostrated person with fluids, either a spoon or a pipette may be used. The fluid should be introduced very slowly into a corner of the mouth and never poured over the tongue in such a way that it strikes the uvula and causes strangling.

CHAPTER XXXII

SYMPTOMS

"Symptoms" are evidences of deviations from the normal in the functioning of the body. A good nurse is observant and alert in noticing and reporting all symptoms.

Temperature, Pulse, and Respiration as Symptoms.—As has been said, the body performs its functions best at an internal temperature of about 98.6°F. Slight deviations do not produce appreciable effect, and we may say that there is a normal range of from 98° to 99°. Ordinary hunger, fatigue, and excitement may produce this amount of variation. When the temperature reaches a point above or below the normal range it may be assumed that the body is not functioning at its best.

Recovery is possible after a larger deviation above than below normal temperature. The body temperature may in certain diseases go as high as 105° or 106° (7° or 8° above normal). It is serious, however, for the temperature to fall as much as two degrees below normal, while a temperature as low as 95° (3.6° subnormal) indicates extreme shock or collapse, with death probable.

The temperature is raised by most infectious diseases which affect the entire body, and by a few other conditions. It was formerly believed that it was the fever or rise of temperature itself which was injurious, and physicians "fought the fever" by cold baths, drugs causing perspiration, reduced feeding, etc. It is now held that the rise in temperature is one of the many "protective reactions" of nature, one which helps to make the body an unfriendly host to the disease germs. A moderate degree of fever is probably curative, and modern physicians direct their attention to the cause of the disease and assist nature to the extent of their knowledge in creating immunity (see Chap. XVIII). Especially do they now support the strength of the patient in every possible way by forced nutrition, rest, and proper

medication. If the fever becomes high enough to interfere with tissue chemistry, cool baths and suitable medicines must sometimes be used to reduce the temperature. Instructions for giving temperature-reducing baths will be found in Chap. XXX.

The degree of temperature is not always an index to the severity of the disease. Some diseases, as erysipelas, show, even in moderate attacks, high temperature which would be very alarming in another disease, while appendicitis or typhoid may be fatal without showing high temperature. The specific character of body reaction to different diseases as shown in the temperature curve is mentioned on page 340 and specific curves will be found in Unit II in connection with the discussion of febrile diseases.

The pulse is counted at any place in the body where an artery lies near enough to the surface to be felt. An anesthetist keeps his fingers on the artery in the temple or under the edge of the jaw of his patient. The usual place for counting is the radial artery on the thumb side of the wrist.

The heart is a wonderful organ which never ceases its rhythmic contractions during the lifetime of the individual. Considering that the heart is the pump which keeps the fluids of the body in circulation and thus feeds and cleanses every cell in the body, it is clearly important in illness to know how the heart is doing its work. Obviously, the heart must work harder the more demands are made upon the body chemistry in the way of burning up fuel to produce energy. This increased demand may be because of work, exercise, excitement, or because of the battle of the body against disease. In general the pulse rate tends to follow the temperature curve, since increased production of chemical energy in the tissues calls for increased supply of oxygen and fuel by way of the blood stream.

The quality of the pulse is as important as the rate. Trained fingers soon learn to detect irregularity, weakness, or hardness in the artery. The student should improve her technic by feeling many arteries at every opportunity in order to become able to detect differences.

Respiration.—Also it will be plain that an increased demand for the exchange of carbon dioxide for oxygen in the lungs will increase the rate of respiration, which also tends to follow the

temperature curve. It is a sign of failing vitality or impending collapse when the pulse and respiration slow down as the temperature rises, or become more rapid as the temperature falls.

Chilling is a protective reaction caused by a toxic irritant in the blood. This irritant may consist of the germs or germ products of an infective disease at the onset, as in the case of the chilling which ushers in a cold, an attack of influenza, or an attack of scarlet fever or smallpox.

Recurrent chilling is a characteristic of some diseases, such as malaria, in which the birth of a new generation of malarial germs causes regular chills followed by abrupt rise of temperature every second, third or fourth day (Fig. 78); or septicemia (blood poisoning), in which chills occur irregularly during the course of the disease.

In young children, whose nervous systems are less stable than in the adult, the reaction to the chemical toxin of a disease may be so violent as to cause convulsions. Chills and convulsions of the types here described are always followed by rise in temperature. In septic fevers the chilling may be accompanied by fever and the patient may have a high temperature and still declare that he is freezing to death.

It is usual to apply heat and covers during a chill, although it is not certain that the physical condition is modified. There is no objection to trying, and the mental effect upon both patient and nurse is good. See page 461 for treatment of convulsions in children, and page 317 for application of heat.

Pain as a Symptom. *The Physiological Basis of Pain.*—The appreciation of pain is the most widely distributed of all the bodily sensations. Any kind of overstimulation or injury of any organ or tissue may cause pain. Sensitiveness to pain varies greatly, however, in various parts of the body. There is disagreement among physiologists at the present moment as to the mechanism involved, some believing that any nerve may register pain, and others that there probably are specific nerve endings for pain as there are for pressure, cold, heat, etc. These endings seem to be free nerve fibers rather than special organs like the taste buds or tactile corpuscles.

Certain areas, as the cornea of the eye, are much more sensitive to pain than are other areas, such as the finger tips, although the

latter are very sensitive to pressure. The vital organs, such as the intestines, liver, uterus, heart, etc., are much more insensitive to pain than are the exposed surfaces of the body.

Localization of Pain.—Pain experienced in the surface tissues of the body is very accurately referred to the proper spot. Pain arising in internal organs may be located very inaccurately.[1] It is often difficult to identify an aching tooth. The pain in a diseased hip joint is referred to the knee. A dislocated shoulder hurts at the elbow. Headache and backache accompany a wide variety of internal disorders.

Individual Sensibility.—The same degree of injury to identical nerves will produce different reactions in different people. Some persons will be able to direct their attention to other matters and will force the pain below the threshold of consciousness. This is likely to occur in those who are very busy, who are carrying heavy responsibility, or who deliberately elect to ignore the cause of the pain, as a girl who goes to a dance in spite of menstrual cramps, or the businessman who is determined not to have a tooth extracted. It is well known that a defective tooth hurts worse at night when the interests of the day are laid aside and there is nothing else to occupy attention.

There is also a great variation in mental attitude. A person who has endured much pain becomes stoical and ignores suffering to a degree quite impossible to a person who is experiencing severe pain for the first time. Children bear pain less well than do adults. Individuals who like to be the center of attention will make a great deal of fuss over moderate discomfort, while well-disciplined persons may not make enough complaint to lead the nurse and doctor to understand their condition.

Significance of Pain.—While pain is nature's warning that something is wrong, the degree of pain does not always indicate the seriousness of the condition. An infection under the periosteum (covering of bone) or in the canal of the ear hurts excruciatingly because of the pressure of inflammatory exudates against the unyielding surrounding tissues. On the other hand fatal diseases of the heart, liver, and kidney may cause little or no pain.

[1] HOWELL, W. H., *Textbook on Physiology*, p. 287, W. B. Saunders Company, 1931.

Character of Pain.—Pain may be of any degree and duration. Chronic disorders may be accompanied by steady but moderate tenderness or aching. Pain may be stabbing or darting (lancinating) and severe as in syphilis of the nerves or in facial neuralgia. The tearing, cutting pain of renal calculi (kidney stones) or gallstones, as they are forced through the ureters or bile duct, is extremely severe. Patients may describe pain as boring, jumping, dull, acute, etc., according to its intensity and character.

The responsibility of the nurse is, first, to observe and report accurately as to any pain her patient may have, and, secondly, to do everything she legitimately can to relieve pain (see pages 319–322 for methods of relieving pain).

Symptoms Associated with Elimination.—*The bowel movements* should be carefully noted. With the normal adult fecal matter is yellowish or bright brown in color, formed but not hard. In the infant it is softer, lighter in color, and smooth in consistency. Abnormal fecal matter may be fluid, contain undigested food, or be hard and formed into pelletlike or rounded masses. The color may be light (clay color), indicating that there is some obstruction in the bile duct, since it is the bile salts which give the stools their brown or yellow color. A dark, tarlike color and consistency may indicate that hemorrhage has occurred (as in typhoid fever). The odor may be more offensive than is normal.

In infants on milk diet the presence of white curds, or greenish color, or liquid consistency should be reported to the physician. It is well to save the diaper for the doctor's inspection.

The frequency of the bowel movement is, of course, to be recorded, also the amount, whether small or large. The nurse places a check in the column for the B.M. and on the same line, under remarks, describes it as: "small, hard constipated B.M.," or "copious, watery B.M., with undigested food," etc. (see page 338). See page 362 for treatment of constipation and diarrhea, and page 308 for technics of giving enemas.

The condition of the kidneys and the status of the body chemistry are shown to a very important degree by the chemical composition of the urine. In some diseases the amount is important, and the nurse must measure every urination. An easy way to prepare a measuring vessel is to paste a vertical strip of adhesive on one side of a large glass jar, pour exactly 8 ounces (one level cup) of

water into it and mark the level on the tape, pour another cupful, and so on. Each cup interval may then be marked in 8 equal spaces for ounces (see Fig. 107).

In certain conditions of hypopituitrism, in diabetes, and during the taking of certain drugs, large amounts of urine may be voided, causing great thirst and dehydrating the tissues. The amount of urine voided should be in direct ratio to the amount of fluid taken into the body. The first thing the nurse should think of, if the urine is scanty and high-colored (concentrated), is to find whether the patient is actually taking enough liquid (3 to 5 pints, all told). (See page 345 for collecting specimen of urine.)

The appearance of blood or mucus or pus in the urine should, of course, be reported. In general the nurse should not draw conclusions from the appearance of urine, as phosphates may precipitate and form a sediment in normal urine in the cold, and marked chemical changes may have taken place in clear urine.

Nausea and vomiting are protective reactions which may occur in almost any disturbance of metabolisn whether from infection, improper feeding, emotional upheaval, or pressure from brain tumor (see page 346 for nurse's duties).

Coughing is also a protective reaction designed to clear the breathing passages of obstructive or irritative secretions. The character of the cough and the expectorated secretion vary with the disease. In pneumonia the secretion may be frothy and tinged with rust-colored flecks of blood. The cough is frequent and shallow and the respiration is rapid and shallow. A harsh, vigorous cough marks the spread of a cold infection to the bronchial passages. An irritable, tickling cough may be caused by an elongated or irritated uvula (the soft palate which hangs into the throat) or by excessive use of tobacco in susceptible persons. Mouth-breathing children having enlarged adenoids and tonsils are apt to cough because of excessive dryness of the throat. Nervous persons sometimes contract a very annoying habit cough. Chronic catarrhal conditions of the nose and throat may be accompanied with copious secretions which must be coughed out. Sufferers from chronic catarrh often have a prolonged coughing spell on rising in the morning.

Like vomiting, coughing may become reflex or nervous and may continue when there are no secretions to be raised.

Sweating may occur as a symptom in various septic conditions, in rheumatic fever, in malaria, under the administration of certain drugs, etc. When fever "breaks" at the crisis of an infection copious sweating may appear. (See page 346 for care of perspiring patients.)

The color of both face and body may be diagnostic as to the condition of the patient. Pallor, sallowness, the yellow color of jaundice, the greenish complexion of malignant tumor, the peculiar bronzing in disease of the adrenal cortex, the purplish tinge of impaired heart action or in overdosage of coal-tar drugs, are examples.

Changes in color may be more apparent on the body than on the face. For this reason it is important, especially with infants and small children, that the nurse see the body often and that she have the habit of noting the color and condition of the body when giving a bath. The texture of the skin should also be noted—whether dry, moist, rough, whether there is rash or eruption or discoloration, etc. All changes should be recorded and called to the doctor's attention.

The posture of the patient in the bed may be important as a symptom. The body tends to protect painful areas. One with appendicitis or gall-bladder trouble involuntarily draws up the right leg. One with pleurisy doubles over on the affected side and tries not to breathe deeply. A patient with meningeal trouble bends backward. A child grasps an infected ear, etc. In extreme prostration a patient slides or slumps down in the bed.

The expression may give an important clue to changing condition in disease. The home nurse will be familiar with the habitual expression of her patient. She should note changes indicating pain, nervous tension, apathy, indifference, mental excitement, etc. This may be an indication of the mental condition or of definite change in physical condition.

The mental condition is important in any illness and should be the constant concern of the nurse. It is now known that the mental state definitely affects the chemical reactions of the body (see pages 148–149). Keeping the mind of a sick person tranquil and happy, and protecting him from nervous friction and from worry, becomes one of the most important responsibilities of the nurse. It is the duty of the nurse to know, by the exercise of all

the tact and insight she possesses, the exact mental state of her patient. She must know when boredom exists and how to relieve it. She should see that the patient has something fresh and pleasing to look at: a different picture on the wall facing him, books and magazines of fresh interest, with devices for supporting them (Fig. 123). Flowers and growing plants to watch, a bowl of fish, a victrola or radio well managed as to tone and selection, an agreeable visitor at the right time, a bit of news, a funny story—all these and more may enter into the agreeable passing of the long monotonous days of convalescence, or nonacute illness (see Chap. XXXVII). Any important change in mental attitude should be reported at once to the doctor.

CHAPTER XXXIII

SPECIAL SICK-ROOM TECHNICS

Keeping a Bedside Record.—Every patient who is ill enough to be confined to bed and have a doctor should have a bedside record. If there is any reason why the patient should not see the record it had better be kept entirely out of her sight, since it is embarrassing to refuse a request. Every hospital has record blanks ruled to suit the particular need and the taste of the administration. The home nurse, however, can rule ordinary letter paper and utilize it for a correct and methodical record. The paper should have a heading across its longer edge somewhat as follows:

Name of Patient Nurse Doctor

Date	Hour		T	P	R	U	B	Medicine, food, treatment	Symptoms and remarks
1934	A. M.	P. M							
Mar. 10		3	102°	95	25			Bath and bed	Chilling, headache; throat sore

Doctor's orders·

What to Record.

1. *The doctor's orders.* The doctor should be asked to write his orders at the bottom of the page. The order should always be dated. It should be crossed out whenever the doctor discontinues it. The home nurse should be certain that she understands the written orders and must not hesitate to ask the doctor to explain them in great detail.

2. *The normal functions of the body* including

a. The exact amount and kind of food eaten and fluids drunk.

b. The exact amount and character of sleep.

c. Elimination by bowel and bladder.

d. The temperature, pulse, and respiration (T. P. R.).

These items give the doctor a picture of the way the living machine is behaving under the stress of the illness. It is the nurse's duty to record this picture with accuracy and thoroughness.

3. *Everything done for the patient.* The wide column for medicine, food, and treatment is the place for recording every item of treatment, food eaten, medicine administered, etc. Such records are made as soon as orders are carried out, never before.

4. *Everything of significance about the patient,* in the last column. This means all "symptoms" such as nausea, vomiting, pain, chilliness, etc. It includes mental and nervous symptoms, significant occurrences such as doctor called, visited for one hour by sister-in-law, etc.

How to Record.—The good bedside record can be read literally at a glance. The home nurse should have this ideal ever before her. The points of importance in achieving this ideal are as follows:

1. *Legibility.* Printing is usually more legible than writing. If the nurse cannot print easily or well she should pay attention to writing in rather small, clear, compact script. The secret of legibility is to write each word compactly, but to leave a definite space between words and sufficient space between lines.

2. *Condense entries.* Cultivate the habit of wording entries like ten-word telegrams. Note the difference: "The patient had a very good night, sleeping most of the time" (12 words). The doctor would prefer this: "Eight hours quiet, refreshing sleep" (5 words).

3. *Put down facts, not opinions.* The doctor much prefers to draw his own conclusions. Note the difference: "The patient does not seem so well this afternoon, has changed for the worse" (nurse's opinion). "Restless, picks at bed, does not notice friends, refused nourishment" (facts).

4. Draw a line across the page at midnight clearly to separate the days. Change the date at midnight.

If the bedside record is orderly and complete very few words need pass between doctor and nurse. In general the condition

of a very sick patient should not be discussed in his presence. If conversation is necessary it should be carried on completely out of his hearing and, if possible, without his knowledge. The hearing of the sick is often very keen and even a deaf person may read the lips of the doctor and the hard-of-hearing may have intervals of almost normal hearing. In anesthesia and unconsciousness the hearing is the last sense to go under. Patients

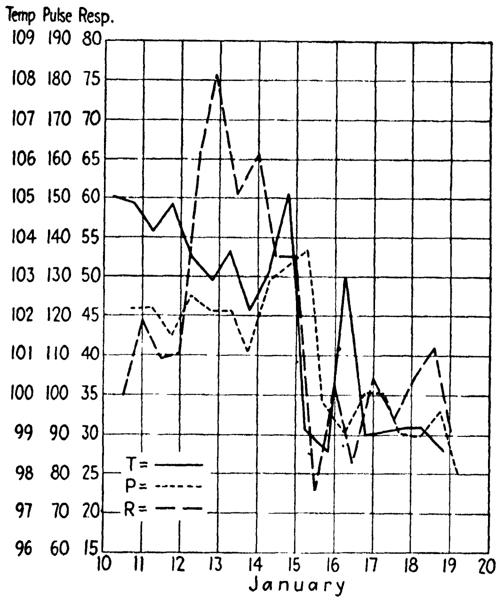


FIG. 115.—Temperature, pulse, and respiration in pneumonia. (*Modified from Osler's, "The Practice of Medicine," D. Appleton-Century Company.*)

frequently hear things they are not intended to hear. The nurse, doctor, and family should be very discreet in this respect.

Charting Temperature, Pulse, and Respiration.—The curves of fluctuations of temperature, pulse, and respiration are characteristic in most diseases, and the doctor may wish to have these plotted on graph paper to assist him in making a diagnosis. The temperature, pulse, and respiration may be charted in three kinds of lines, making a graphic picture of the trend of the disease (Fig. 115). In Figs. 73, 75, and 78 characteristic temperature curves in several diseases are shown.

To Take Temperature, Pulse, and Respiration.—Unless otherwise directed the nurse will always take the T. P. R. approximately every four hours while the patient is awake. This is as much a matter of course as serving meals.

The Thermometer.—Body temperature is taken with a clinical thermometer, which differs from weather and cooking thermometers in that the mercury column expands (rises) with heat but does not contract with cold. This makes it necessary to shake down the mercury instead of bringing it down by placing it in cold water. The clinical thermometer consists of a glass cylinder beveled on one side and having at one end a very thin expansion which is the bulb containing the mercury. From the bulb a minute canal runs to the end of the cylinder. When the bulb is warmed the mercury expands into the hairlike tube. On one of the beveled surfaces a scale in degrees and fifths of degrees is engraved in the glass. The lowest degree is usually marked 94°, the highest 108° or 110° Fahrenheit.[1] Life would not be possible at either of these extremes. At 98.6° an arrow marks the so-called "normal temperature."

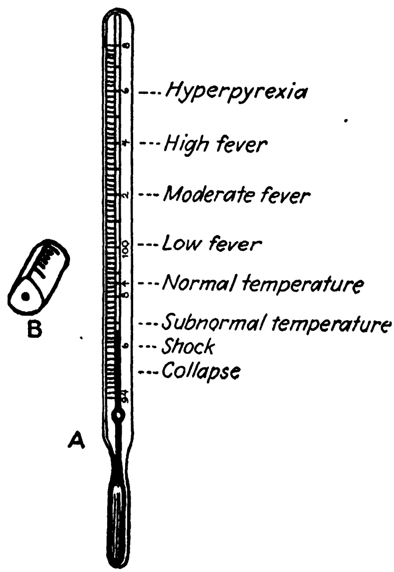


FIG. 116.—*A*, clinical thermometer; *B*, cross section showing beveled side.

In using the thermometer the first thing to learn is to hold it without dropping it. It should be grasped by the blunt end firmly between the right thumb and forefinger. A nurse never touches the mercury bulb. Try to imagine it is red-hot and will burn you if you touch it! Since the mercury is to be shaken down with each using it is necessary to learn to grasp firmly with

[1] The ordinary commercial clinical thermometer has the Fahrenheit scale. It is possible to get thermometers having both Fahrenheit and Centigrade or Centigrade alone if desired.

thumb and finger while maintaining a loose wrist. It is prudent to practice this "whipcracker" fling first with a lead pencil!

Now look directly through the beveled edge of the thermometer, turning it slightly until you are able to see the mercury column, which will be magnified and appear as a silver ribbon. The next step is to learn to read the scale, which is usually marked with the even numbers only. Each small mark between the longer degree marks indicates one-fifth of a degree.

Having shaken down the mercury column to 96° or lower, and having become able to see and read the mercury, the nurse next wipes the thermometer with a pledget of cotton wet in antiseptic and places it in the patient's mouth.

Ordinary clinical thermometers are made to register in one minute. Since it may take a few seconds for the mouth to warm up it is usual to leave the thermometer in place for two minutes. The patient is instructed to close the lips but not the teeth, and the thermometer should be slipped to one side of the frenum (ligament anchoring the tongue) under the tongue as far as it will go. The patient should have had nothing in the mouth for ten minutes before taking the temperature. The thermometer is removed, read, the reading is recorded, the thermometer is wiped again with antiseptic, shaken down and replaced in the case or in a tumbler of solution.

It is usual in an illness of any duration to stand the thermometer in a tumbler half filled with antiseptic solution and having a piece of cotton in the bottom to protect the fragile mercury bulb. Another tumbler may hold pledgets of cotton for wiping the thermometer. Before insertion in the patient's mouth the thermometer is wiped with a piece of dry cotton, and it is always washed before it is replaced in the solution.

To Take Temperature by Axilla.—It may be impossible to take the temperature by mouth because of infection or injury in the mouth or throat or because of delirium or unconsciousness. In this case it is usual with an adult to place the mercury bulb well up in the axilla, holding the arm firmly against the chest for three minutes. The temperature will be one to two-fifths of a degree lower than in the mouth of the same individual.

To Take the Temperature by Rectum.—Occasionally with adults, and usually with infants, temperature is taken in the rectum.

The thermometer is oiled and introduced with a twisting or rotary movement to prevent the end from catching in pockets of the membrane, as mentioned under enemas, page 309. No force whatever is to be used in introducing anything into the rectum. The thermometer will register in one minute and the reading will be one to two-fifths of a degree higher than in the same individual by mouth.

The temperature should be written on the bedside record before the thermometer is shaken down, as it is very easy for an amateur nurse to forget the reading.

To count the pulse the nurse should stand at the right of the patient, who lets her right hand lie easily across her chest. The nurse places her right hand across the back of the right wrist of the patient in such a manner that the tips of her four fingers roll about the thumb side of the wrist and come down upon the radial artery in the groove between the ligaments and the radial bone. In her left hand she holds a watch with a second hand. She starts counting as the second hand touches a quarter mark. She starts over at the next quarter, thus counting for a full minute by quarters. If the quarters count the same multiply one count by four, if different add them.

To Count the Respiration.—When through counting the pulse, without moving the nurse transfers her attention from the pulse to the heaving of the chest, which may be felt as she rests her hand upon the patient's wrist; the nurse should also look at the chest and watch the breathing impulses for a full minute. The reason for counting the respiration when the patient is unaware of it is that it is difficult to breathe naturally if one is conscious of being watched.

The pulse and respiration may be counted during the two minutes the patient holds the thermometer in her mouth, thus shortening the total time appreciably.

Abbreviations.—In hospitals certain abbreviations are used which simplify recording. The following are some of those most used:

T. P. R.:	temperature, pulse, and respiration.
℞:	prescription, commonly used to indicate any medicine.
q:	quantum or interval. "℞x. q 4 hrs" means give the prescription every four hours.

Stat.: At once, or as soon as possible. A "stat" order is an order to be carried out as soon as the nurse can manage to do so.
S.S.: Soapsuds. An S.S. enema is a soapsuds enema.
s.s. one-half, ℥s.s. one-half ounce.

A Suggested Exercise in Making a Bedside Record.—The student should rule sheets of paper according to the form given on page 338. She should then live through, in her imagination, the events of the following case and record them properly as they occur.

On March 10, 1934, Johnnie Smith (age 11) was sent home from school at 3 in the afternoon. He told his mother that he felt cold, his head ached, and his throat hurt. His mother looked in his throat and found it red, with patches of white on the tonsils. She took his T. P. R. and found them to be T. 102°, P. 95, R. 25. She called Dr. Wallace, then gave Johnnie a bath and put him to bed.

Dr. Wallace came at 4, swabbed Johnnie's throat with iodine, and left the following orders: ℞ every 4 hours; gargle every 2 hours; cold compress on throat changed every 6 hours. Give half an ounce (℥ss) of castor oil stat (at once). Give a soapsuds (S.S.) enema stat. Give fluids freely, liquid diet every 2 hours.

On March 11, Dr. Wallace called at 10 A.M. Mrs. Smith gave him the following report orally, except that she had recorded the T. P. R.'s on a scrap of paper. T. P. R. at 8 P.M., 103°-110-30; 12 M., $101\frac{4}{5}$°-90-24; 4 A.M., asleep; 8 A.M., $101\frac{4}{5}$°-85-22. Gave castor oil at 4:30, vomited; repeated at 6 and retained. Gave S.S. enema at 4:30; hard, constipated B.M. At 5 A.M. had a loose, copious B.M. Urinated freely at 4:30 P.M.-12 M.-5 A.M. Gave ℞ at 6-10-6. Gargle at 6-8-10-12-6-8. Compress applied at 6-12-6. Slept from 12:30 to 5 A.M. Drowsy but restless first half of night. Refused nourishment at 6 P.M. At 8 P.M. ½ glass lemonade; 10 P.M. ½ glass cold milk; 12 M. glass hot malted milk. 6 A.M. cup of hot cocoa; 8 A.M. glass of egg and milk. Short nap between 6 and 8 A.M. Drank water freely.

Dr. Wallace swabbed the throat—found patches almost gone. Left the following orders: Stop ℞ and compress. Gargle every 4 hours. Give light diet. Report this evening by phone.

At 9 P.M. the mother reported as follows: T. P. R. at 12 noon, 100°-85-20; 4 P.M., 99°-83-18; 8 P.M., 98.5°-80-18. Gargled at

12-4-8. Urinated at 9 A.M., 1 P.M., 6 P.M. Bowel movement at 9 A.M. At 10 A.M. had glass of orange juice. 12 noon, bowl of rice and milk, baked apple, and glass of milk. At 4 P.M. glass of milk. At 6 P.M. cup of cocoa, scrambled egg, spinach, stewed prunes, ½ slice bread and butter.

Restless and wants to get up.

The doctor said, "Discontinue all orders and keep at home one more day."

To Secure a Specimen of Twenty-four-hour Urine.—The nurse will have the patient void urine at the hour determined upon to start the procedure. This is thrown away and the patient starts with an empty bladder. Every urination up to and including urination at the initial hour the following day is placed in a large sterile container. When all the urine voided within exactly 24 hours is collected in one vessel:

1. *Shake it thoroughly* in order that it may be of uniform composition throughout.
2. *Measure the amount.*
3. The last 4 to 6 ounces is placed in a sterile bottle as the doctor's specimen.
4. The bottle is *labeled* with *name of patient, date, total amount.* It should be sent at once to the laboratory.

Difficult or painful urination should always be reported at once to the physician. The spasm of the urethral muscles can be relaxed to some extent by heat, as by placing hot water in the bedpan before giving it to the patient and applying moist or dry heat over the region of the bladder.

The old device of letting the patient listen to water trickling from a faucet, or from one vessel to another, will often work, especially with children, where the spasmodic constriction of the urethra is in part nervous.

Many persons find it difficult to void urine when lying upon the back, particularly during the first days of an illness. Physicians sometimes permit the patient to be raised into a sitting position upon the bedpan. This must be done without any effort or exertion upon the part of the patient, and there should be three helpers: one on each side of the patient and a third to hold the bedpan securely. Each person lifting should place one hand under a knee and the other under a shoulder. The two lifters

pull at the same moment, bringing the patient into a sitting position upon the bedpan with the knees flexed.

In some cases the physician will permit the patient to be assisted to a bedside commode. The technic of helping the patient is the same as that described on page 290 for helping a patient into a chair. (See page 306 for illustration of homemade commode.)

In some chronic conditions, especially with old persons, it is necessary to withdraw the urine with a catheter as a routine. The most scrupulous care is then necessary to avoid infection. The catheter with pledgets of cotton for wiping the area about the urethral opening must be boiled just before using and the catheter is usually kept in a small closed jar of antiseptic.

If a laboratory examination of fecal matter is ordered the nurse will have the patient void urine, then move the bowels into a sterile vessel, which is covered and sent at once to the laboratory.

Both stools and urine should be disinfected in contagious conditions of the digestive tract such as typhoid and certain dysenteries. To disinfect such excretions a liberal amount of chloride of lime, javelle water, or other cheap disinfectant should be placed in the bedpan. This should be sufficient to cover the stool, which is then shaken or stirred until thoroughly mixed with the disinfectant, and permitted to stand, covered, for 10 to 15 minutes before being emptied into either indoor or outdoor toilet.

Nausea and vomiting are protective reactions on the part of the body, indicating that conditions are not favorable for the digestion of food. This may be due to the onset of an acute illness, or because of something taken into the stomach. Usually the symptoms disappear when the stomach and bowels are thoroughly emptied. It is unwise to introduce food until the digestive tract has had time for complete recovery. In extreme cases the spasmodic contractions may become reflex and the patient may continue retching from an empty stomach, or, in very extreme cases, "reversed peristalsis" may occur and the bile and even food from the upper bowel may regurgitate into the stomach and be vomited. The possible duties of a nurse may be listed as follows:

1. Support the head of any patient while vomiting.
2. Give water at once to rinse vomitus out of the mouth.

3. If the retching is violent give warm water in large amounts in order to make vomiting easier and in order to hurry up the complete emptying and cleansing of the stomach.

4. If reflex or nervous vomiting continues after the stomach is emptied, heat applied to the region of the stomach and cold to the throat may relieve. A hot-water bag, electric pad, hot wet compress, or even a mustard poultice may be used over the stomach. A compress wrung out of ice water may be applied to the throat, or an improvised ice collar made from a piece of inner tube.

5. The head of a nauseated person should be low. The pillow may be removed and a towel spread under the head. In case of reflex vomiting, such as may occur after an anesthetic, a small basin should be held under the chin and cheek, and the patient should not lift the head.

Care of Perspiring Patients.—In the case of pathological sweating there is general relaxation with lowering of vitality, the body is literally "leaking at the pores" and the nurse must be extremely careful about chilling the body. Everything used must be warmed, even in July or August. Warm towels should be used to dry the body frequently, but this should be done under the covers. Rubbing alcohol should be warmed; the bedpan should be warmed. Clean bedding should be warmed when the bed is changed. If the body of the patient can be kept warm it is not necessary to have the air in the room unduly warm, since this is debilitating.

To Prevent Insomnia.—The nurse is responsible in large measure for making conditions favorable for sleep. The important points are the following.

1. Prepare the patient for the night early so that she may fall asleep with her first drowsiness.

2. See that the patient is relaxed mentally. This may require sidetracking the mind from the worries of the day by reading a short story or a poem, providing soothing music, or doing whatever the nurse can devise to meet the particular situation.

3. The circulation must be equalized, *i.e.*, the blood should be diverted from the head to the feet, since anemia of the brain is one of the factors in producing sleep. This may be accomplished by: (*a*) applying heat to the feet; (*b*) thorough massage of back and neck; (*c*) giving a hot drink.

To Prevent Bedsores.—In the case of long illness, poor nutrition, illness or injury involving helplessness, and with the aged, constant care is necessary to preserve the vitality of the pressure points. The important items are as follows:

1. The surface under the back and hips must at all times be smooth and free from wrinkles or crumbs. The patient should wear only gowns open in the back.

2. Pressure should be relieved frequently and regularly by the use of "doughnut rings" (Fig. 107) and cushions, and by shifting the position of the patient as much as the condition will permit.

3. The skin must be kept clean and dry at all times. (See method of bathing back of helpless patient, page 298.)

4. The tissues must be thoroughly and frequently massaged, especially the pressure areas over the scapulae, the spine, and the hipbones. This must be done not only at the time of the morning and evening toilets, but once or more times between. (See directions for rubbing the back at the time of the bath, page 298.)

CHAPTER XXXIV

MEDICINES AND DRUGS

The chemical balances and reactions of the body (which really furnish the basis for most of our study) may be affected by food, drink, exercise, and emotion, in short, by all the experiences of life. Also they may be quickly and powerfully affected by concentrated chemical substances called "drugs." Human ills were formerly treated largely by means of drugs. As more becomes known about normal body chemistry medical science uses fewer drugs and depends more and more upon the use of diet, the correction of health habits, and the use of physiological serums and glandular extracts. Drugs still have their place, however, and the home nurse and homemaker need to be intelligent about their use.

The Use of Drugs in the Home.—Laymen should be very cautious in using and prescribing drugs without a physician's orders, for the following reasons:

1. Drugs nearly always have several effects other than the effect for which they are taken. Opiates relieve pain, to be sure, but they also dry up the normal secretions, cause constipation, and are habit-forming. Coal-tar drugs, such as aspirin and acetanilide, relieve pain and reduce congestion, but they also relax the blood vessels and put an additional load upon the heart. Calomel causes evacuation of the bowels, but it may be very toxic and irritating if not given properly, with precautions to secure complete elimination of the drug.
2. The lay person cannot be expected to diagnose his own case: he may take a urinary stimulant when he should have a depressant or a urinary antiseptic. He may take a cough medicine which will check secretions when there should be free drainage of the bronchial passages or vice versa.
3. Certain drugs have a cumulative character; that is, repeated doses produce delayed or explosive effect and the cumulative or piled-up effect may be serious or even dangerous. Certain heart medicines act in this manner.

The homemaker should never take it upon herself to buy and prescribe drugs, or use in one illness medicines left from another,

even though the symptoms seem to her to be similar. Only the simplest and most familiar home remedies should be kept and used, and prescriptions of every sort should be thrown away on termination of illness.

Patent and Proprietary Remedies.—A patent gives the holder some exclusive and individual right, as stated in the record, with reference to the article patented. This may be the right to manufacture according to the stated formula, the right to sell, or the right to use a specified name as applied to the article or formula described. In other words the manufacturer becomes the exclusive "proprietor" of the thing patented. A patent medicine commonly signifies that some person has secured an exclusive patent right to manufacture and sell a formula which he asserts has new and valuable curative properties, and that the formula itself is kept secret from the public. What is commonly known as a proprietary remedy is a remedy sold under a patented trade name and having the formula printed upon each bottle and package. The only claim is that the manufacturers have an especially good way of compounding the prescription. Physicians never use medicines the composition of which is unknown to them, but they frequently use proprietary preparations as a matter of convenience.[1]

Patent medicines should never be used for the following reasons.

1. Every known medical drug, herb, or substance has been analyzed and described in the U. S. Pharmacopoeia which every druggist uses.[2] The claims that patent remedies contain new and wonderful discoveries are entirely false. No new medicinal substance has ever been found in the analysis of any patent medicine.[3]
2. Patent medicines invariably cost more than the same materials would cost as a physician's prescription.
3. It is foolish to take unknown substances, not knowing whether they will be wrong or right for the condition; valuable time may thus be lost in securing proper treatment.

[1] Wilbert, Martin I., *The Limitations to Self Medication,* Public Health, Reprint No. 256 U. S. Public Health Service, Washington, D. C.

[2] *New and Unofficial Remedies,* Report of the Committee on New and Unofficial Remedies, American Medical Association Press, 1935.

[3] An exception to this is *viosterol,* which was patented by a scientific organization, not for profit, but to prevent the exploitation of the public by manufacturers who might make undue claims for its efficacy.

Medical ethics requires any physician who makes a useful discovery to share it at once with the rest of his profession. A physician who would patent, conceal, or try to profit personally from any discovery which might alleviate suffering or promote health would be expelled from all medical organizations and be deprived of his certificate to practice. The fact that the holder of a medical patent is keeping his alleged discovery from the world to his own profit is enough to destroy any faith in him or his production.

The Pure Food and Drug Law.—In 1906 a Federal law was passed making it illegal to ship between states food or drug products containing harmful or adulterative ingredients, misbranded, or bearing a deceptive label. Each state passed a similar law regarding the manufacture, sale, and use of such substances within the state. These laws have been a great protection to the health and pocketbook of the public. A bill is now before Congress asking for the inclusion of cosmetics, which have come into general use since the passage of the act now in force, and including other features, designed to bring the law up to date. One should always examine the label of any bottled or package goods used.

The Harrison Narcotic Act is a federal act passed in 1915 prohibiting the shipment or transportation of narcotics into the United States, or between states, except as stipulated in the act. The amount and location of every particle of narcotic in the United States are matters of record unless it has been smuggled. Each state requires physicians and pharmacists to register annually. They must keep a record of every prescription or sale, with identifying names of physician, dates, and prescription numbers, for any preparation of the narcotics: opium (morphine, apomorphine, laudanum, paregoric, codeine); cocaine and a preparations of coca (not to be confused with cacao, from which cocoa and chocolate are derived); and several other rare narcotics. The public has been protected tremendously by these laws, even though there is evasion of them and much illegal sale.

The Administration of Medicines.—Medicines are usually diluted in the making up of prescriptions to a degree which makes a teaspoonful dose the average amount administered. A graduated medicine glass is sufficiently accurate for such prepara-

tions and gives space for further dilution. A graduated glass should stand on a level surface and the medicine level should just touch the indicated mark.

It is important that anyone handling medicines should be able to read and understand labels and prescriptions accurately. The following table gives the common and metric systems of measurements of both fluids and solids.

Weights and Measures

1 grain (weight) (gr. i.) = approximately 65 milligrams
1 minim (measure) (m. i.) approximately 1 drop = 65/1,000 of a cubic centimeter (cc.)
15 grains (weight) (gr. XV) = approximately 1 gram (gm.)
15 minims (measure) (m. XV) = approximately 1 cubic centimeter
1 dram (weight) (iʒ) = approximately 4 grams
1 fluid dram (measure) (flʒi) = approximately 4 cubic centimeters
1 ounce (weight) (℥i) = approximately 30 grams
1 fluid ounce (measure) (fl℥i) = approximately 30 cubic centimeters
1 teaspoonful = approximately 1 dram or 4 grams; 60 minims or drops of water, or 4 cc.
8 teaspoonfuls, 8 drams, 32 grams, or 2 tablespoonfuls = 1 (ounce) (℥i)
8℥ = 1 cup, glass, or tumbler of standard size.
16℥ = 1 pint, 2 cups, or approximately 500 cc.
32℥ = 2 pints, 1 quart, 1,000 cc., or 1 liter.
4 quarts = 1 gallon

The Care of Medicines.—There should be in every home (see page 280) a cabinet or cupboard in which nothing but medical supplies is kept. The entire family should be familiar with the contents and their use. The contents should be kept up-to-date, and absolutely nothing should be put on these shelves which does not belong there. Medicine glasses, pipettes, and everything else should be put away clean and ready to use.

Giving Medicines.—When the time comes to give a dose of medicine everything should be prepared: the measure, the glass of water, something to take away the taste, etc. If there are several articles involved they should be assembled upon a small tray or platter. Fluid medicines should be poured from the side opposite the label and the stopper or screwtop replaced at once. If it is necessary to put down the cork or screw top it should be placed top down. Usually the cork may be extracted with and

held between the second and third fingers of the right hand and replaced at once without being laid down. Capsules or tablets should be dropped upon a spoon or small dish. The nurse should never touch with her fingers anything which is to go into the patient's mouth.

Powders should be opened and the paper creased the opposite way from the original folds to throw the powder into a compact mass. The patient is requested to open the mouth and extend the tongue as far as he can. The powder is dropped as far back on the tongue as possible and the patient is given water to drink. In this manner the powder is swallowed in one mass and does not become distributed among the teeth and the taste buds of the tongue.

Several things can be done to minimize the unpleasantness of certain medicines: Holding ice in the mouth just before taking medicine dulls the sense of taste. Oils may be chilled before taking. Holding a peppermint drop in the mouth before or after taking medicine tends to cover up the taste. With oily or "sickish" medicines sucking a piece of lemon or drinking an acid or effervescing drink will help. With bitter or salty medicines chewing a cracker seems to absorb the flavor and arouses salivary action which tends to wash away the bitterness.

In administering oils, such as castor oil, perhaps the most effective method is to place citrous or other fruit juice in a medicine glass, and carefully pour the oil into the center without permitting it to touch the glass. Twirl the glass to throw the juice over the bolus of oil. If the patient can swallow this in "one gulp" he will get little or none of the oil on tongue or teeth.

CLASSIFICATION OF MEDICINES

There are numerous ways of classifying drugs and medicines. The very simple method will here be used of grouping remedies roughly according to the organ or structure chiefly affected, although most drugs actually influence several or many body functions.

Drugs Which Act upon the Nervous System.—Drugs may act in many ways upon the nervous system, stimulating all or only specific nerves, or depressing all or only specific nerves. The effects may be most obvious in nerve structures themselves, or

they may be most obvious in changed function of specific organs which the nerves control. The drugs which produce their effects through the nervous system may be classified as stimulants and as depressants or sedatives.

Drugs Which Stimulate the Nervous System.—STRYCHNINE (Strychnia) is the most extensively used drug stimulant. Strychnine, an alkaloid derived from the seeds of the nux vomica plant, has been used in medicine for more than a hundred years. It is a powerful, concentrated, highly soluble substance which is given in very small doses, $\frac{1}{30}$ to $\frac{1}{60}$ of a grain. One-half grain may cause death, and in children much less may be fatal. Strychnine affects first the spinal cord, stimulating all reflexes which are controlled through the cord and sympathetic nervous system. In larger doses it stimulates the medulla. The tone and irritability of both smooth and striated muscle are increased. Because respiration, digestion, and intestinal tone are all stimulated there is generally increased function. For this reason a little strychnia is added to many tonics and to many cathartic mixtures. Strychnia is very commonly prescribed in convalescence, and is combined with depressant drugs as a protection.

In overdosage there is violent contraction of all reflex arcs, and convulsions may occur and may become so frequent and severe that the respiratory center is paralyzed and death results. The cortical or thinking centers are not affected, and the mind remains clear to the last.

Because strychnia is often prescribed in convalescence, and is found in tonics and cathartics, children frequently get hold of such pellets, or pills, or solutions, and get enough in one swallow to be serious or fatal. Strychnia is the most frequent cause of poisoning in children.[1] On account of the bitter taste no person will be likely to continue swallowing it. The resemblance of pills to candy is the lure which leads the child to eat them.

Treatment of overdosage consists, first of all, in judging of the source, form, and amount taken. If there is any possibility of recovering any of it not yet absorbed from the stomach, quantities of warm water to wash out the stomach should be given instantly. If soluble hypodermic tablets have been taken, or a fluid, or if

[1] MUSE, MAUDE B., *Materia Medica and Pharmacology for Nurses,* W. B. Saunders Company, 1933.

tablets have been taken sometime before and the fact is not discovered until the symptoms occur, it is quite useless to try to recover any unabsorbed strychnia from the stomach, and the agitation and strain of forced vomiting would be very bad for the victim.

The utmost quiet must be maintained. The patient should lie in a darkened room and should be cared for by one person and that a person who can move and speak quietly. She must not jar the bed or startle the patient by speaking quickly or making sudden noises. Fluid elimination may be encouraged by giving copious hot drinks. A physician must, of course, be summoned with haste. Sodium luminal is the true antidote (see page 361). Apomorphine, barbital, sodium amytal, and chloroform are used. The narcotic drugs, such as the opiates, are no longer used.[1]

CAFFEINE is obtained from tea, coffee, or kola.[2] It is a respiratory, circulatory, and nerve stimulant. It lessens the sense of fatigue and stimulates cerebral activity. In excess it causes sleeplessness, palpitation of the heart, nervousness, and headache, and in toxic doses may cause convulsions and dilatation of the heart.

CAMPHOR is a mild stimulant to the heart and respiration when either taken by mouth (10 to 15 drops diluted with water or dropped on a cube of sugar) or inhaled.

AROMATIC SPIRITS OF AMMONIA stimulates respiration on inhalation and is a mild stimulant to heart and nervous system when given by mouth. (1 teaspoonful in half a glass of water.) Aromatic spirits of ammonia is the active ingredient of all "smelling salts."

ATROPINE, an alkaloid of Belladonna Atropa, is a cerebral (brain) stimulant. As used in belladonna plasters and ointments it relieves local pain (is anodyne). It dilates the pupil of the eye (is mydriatic), dries all secretions, and in overdose may cause delirium and death.

QUININE, an alkaloid from the plant cinchona, stimulates smooth muscles; hence it is used in tonics and cathartics, to increase contractions of the uterus in slow childbirth, etc. Full doses briefly stimulate skeletal and cardiac muscle. Overdosage

[1] Editorial, *Journal of the American Medical Association,* June 4, 1932.

[2] One of the active ingredients of Coca Cola.

causes ringing in the ears, headache, and collapse. Quinine is a valuable specific in the treatment of malarial infection.

Drugs which depress the nervous system include, first of all, preparations of opium.

OPIUM is obtained from the milky juice of the opium poppy. It comes chiefly from the oriental countries. While the importation, manufacture, and use of all preparations of opium in the United States is controlled by the Harrison Narcotic Act (see page 351), the sale of opium has always been such an important source of revenue in the opium-raising countries that it has never been possible until 1931 to arrive at an international agreement restricting production to the scientific and medical needs of the world. A number of opium conferences had been held by the League of Nations, some of them lasting for weeks and months, without arriving at any agreement. Under such conditions there has been a great amount of smuggling and surreptitious sale in this country. As soon as the machinery for curtailment of production, for disposal of existent stock, and for the necessary regulation and inspection have been put into effective operation, there should be a great reduction in drug addiction.

THE ACTION OF OPIUM.—Opium contains the alkaloid narcotine, and all preparations of opium on entering the blood stream deaden the reaction of the sensory nerves. This may vary from the mere allaying of irritable reflex action in a cough, to relief of acute pain, to drowsiness, profound unconsciousness, and death. Opium has a specific effect upon the respiratory centers and causes slow respiration with consequent slowing of the pulse. The strength of the heart is not impaired; death results from paralysis of respiration. The pupils of the eyes contract to "pin-point" size. This is one of the specific signs of overdosage of opium.

By deadening or depressing nervous action the natural secretions are lessened. The mouth is dry; constipation and lessened secretion of urine result. The most serious and lasting effect of taking opiates is that most preparations of opium are strongly habit-forming.

THE PREPARATIONS OF OPIUM CHIEFLY USED IN MEDICAL PRACTICE are morphine, apomorphine, codeine, and, formerly, heroin. Formerly tincture of opium, laudanum, and paregoric

were extensively used. Apomorphine is a derivative of opium having specific medicinal uses but differing greatly from the specific narcotic preparatios of opium.

MORPHINE is a salt of narcotine which is used hypodermically for the quick relief of severe pain. It is a boon to humanity in this respect. Physicians have learned to be very careful not to administer it repeatedly, however, on account of the danger of establishing craving, and also because of the secondary effects mentioned.[1] Some of the morphine may break down into apomorphine and cause sweating and vomiting. Morphine is only used hypodermically.

APOMORPHINE is an artificial alkaloid of morphine which is a powerful emetic and relaxant and is used when quick emptying of the stomach, or breaking of nervous tension, is necessary. It is not habit-forming.

CODEINE is an alkaloid of opium which is milder and slower in action than morphine. It is not so habit-forming as morphine, and since it is not so irritating to the stomach it can be taken by mouth. It is not so depressing to the respiratory centers and not so constipating. Codeine is often prescribed for irritable coughs and for chronically painful disorders.

Although codeine is less dangerous than morphine it is more apt to be found in the ordinary home, and children have been poisoned by it. Codeine may be habit-forming and is included in the provisions of the Harrison Narcotic Act.

HEROIN is an opium compound which is sedative in its action and distinctly habit-forming. It was formerly widely used as an ingredient of cough medicines, but on account of frequent report of fatalities its importation, manufacture, and use have been prohibited by federal law.

POWDERED OPIUM AND TINCTURE OF OPIUM (laudanum) are less used in medicine since the increased use of alkaloids.

PAREGORIC (camphorated tincture of opium) is a mild preparation in syrup of such strength that a teaspoonful can safely be

[1] Morphine appears to disturb the water distribution of the body, withdrawing water from the liver, kidneys, and brain. On sudden withholding the condition is reversed and the organs are gorged with water. (*Science News Letter*, Aug. 29, 1932.) It is a serious matter to disturb the fluid balances of the body (see page 113).

given to a small child; that is, "safely" as far as life is concerned. Before the Harrison Act a great many "soothing syrups" were on the market, all depending upon paregoric for their quieting action. A crying baby would go to sleep, but the mother did not know that the drug was also putting all the vital organs to sleep. Glands, digestion, elimination, circulation were all being slowed down by this treacherous drug. The Harrison act, through putting all patented narcotic preparations off the market and putting the dishonest physician under penalty of the law, has saved the lives of many infants.

SYMPTOMS OF OVERDOSAGE OF ANY FORM OF OPIUM: pinhole pupils, slow pulse (usually strong), and very slow respiration, with overpowering drowsiness, ending in paralysis of the respiratory muscles, unconsciousness, and death. (For treatment see page 470.)

COCAINE is an alkaloid derived from the leaves of the coca plant (cocoa and chocolate are derived from the seeds of the cacao plant and are quite different in every way, although the name is similar). Cocaine is strongly habit-forming, and comes under the Harrison act. It is valuable as a local anesthetic and in its improved forms is much used in minor surgery, tonsillectomy, and even, occasionally, for major operations. It is a general protoplasmic poison. It stimulates the brain briefly but the effect quickly passes over into depression.

Cocaine was formerly much used for shrinking congested nasal passages and opening up and draining infected sinuses. *Novocaine*, *procaine*, *eucaine*, and other newer preparations are safer and have largely replaced cocaine in medical practice. Habitués sniff the white cocaine powder ("snow," "happy dust") up the nostrils. The narcotic effect upon the brain centers may produce a sense of well-being which is delightful. In habitués this is followed, as the effect wears off, by an agonizing craving and intense depression. All narcotic drugs will produce profound unconsciousness and death when taken in excess.

SYMPTOMS OF OVERDOSAGE are varied, and include dilated pupils, nausea, vomiting, violent headache, excitement, even convulsions, collapse, and failure of the heart.

TREATMENT consists in ice to the head, quiet and sedatives during excitement, with black coffee, aromatic spirits of ammonia, etc., when depression comes on.

BROMIDES are alkaline salts of the heavy metal bromine. Those chiefly used in medicine are the sodium, potassium, and ammonium bromides. Bromides depress both brain and heart, and are chiefly employed for quieting the nervous excitements of insanity and epilepsy and in insomnia due to overactivity of the brain. Since the bromides depress the coughing and vomiting centers in the medulla they are sometimes used to quiet reflex conditions of this kind (see pages 335 and 346). The bromides are sometimes wrongfully used to allay the nervous instability due to fatigue and chronic strain. Needless to say this is only piling up trouble for the future.

OVERDOSAGE, if acute, produces excessive mental depression and may cause death from heart and respiratory failure. In continued moderate overdosage, skin eruptions, headache, poor circulation, bad breath, mental stupor, and drowsiness may appear.

TREATMENT consists in stopping the taking of the drug, forced elimination, giving copiously of fluids, heart stimulants when indicated, etc. No one should ever take bromides, not even "bromo-quinine," except under a physician's orders.

MARIHUANA, hashish, Indian hemp, cannabis sativa, also incorrectly called loco weed, is a plant which is made into cigarettes ("reefers") and smoked because of the peculiar effects produced. It does not produce unconsciousness but it does obliterate all sense of reality, and all ideas and impressions are enormously magnified. A touch on the shoulder may seem like a blow and demand retaliation but, before the individual can strike, another exaggerated vision or idea has surged into his mind. All social inhibitions disappear. In older civilizations hashish has been used in religious ceremonials and superstitious reverence has attached to the "visions" so produced.

There is disagreement as to the habit-forming qualities of the drug and as to its exact physical effects. It does arouse sex emotion and seems to feature in sex orgies of a low character, and an individual under its influence may exhibit conduct entirely foreign to his real nature.

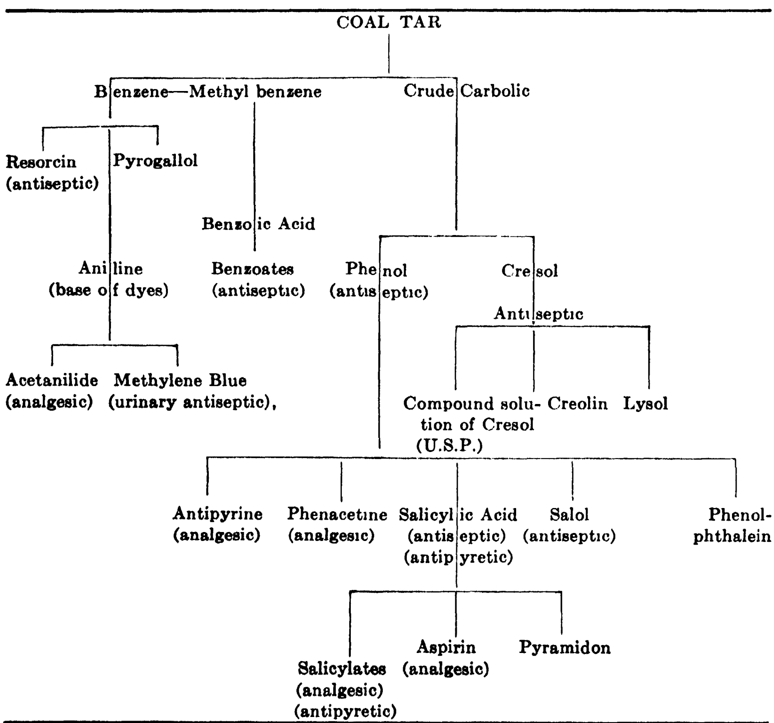
There seems to be a passing flair at the present time for "reefer parties" and reefers are said to be surreptitiously sold to high-school pupils and college students. This extensive use is recent, and the drug is not mentioned in the federal narcotic act. Thirty-

four states, however, have legislated against its use, and there should be concerted action to suppress the manufacture and use of marihuana cigarettes.

COAL-TAR DEPRESSANTS.—A large number of medicinal substances are derived directly or indirectly from coal tar (see diagram. Among these is a group known as pain reliefs (analgesics) which are so widely used that they should have special consideration. These are *antipyrine*, *phenacetine*, *acetanilide*, *aspirin*, *pyramidon*, and other proprietary preparations.

All are powerful depressants of the central nervous system probably relieving pain through blocking of the sensory synapses at the basal ganglia. They reduce temperature, weaken heart action, and produce cold sweating, blue lips and fingernails, and

DIAGRAM OF COAL-TAR DERIVATIVES



PARKER, LINETTE, "Materia Medica and Therapeutics," *Textbook for Nurses*, p. 118, Lea & Febiger, 1916.

anemia. Formerly these drugs were given to reduce temperature in fevers. Since the nature of fever is better understood this is seldom done (see page 314). The principal use now made of the coal-tar analgesics is for the relief of the congestion in colds, and for headache, menstrual cramps, rheumatism, neuralgia, or other painful condition.

While this class of drugs may not create actual craving for the drugs themselves, taking them creates a habit of use which tends to prevent the prompt diagnosis and treatment that would occur if the sufferer did not have ready relief at hand. There are instances reported of actual habit in taking aspirin. (One group of 400 physicians reported 814 cases of poisoning, 29 deaths, and 136 habitual users.) The custom of keeping aspirin or other pain relief on hand and taking it for every discomfort is to be strongly discouraged. Since relaxed blood vessels make it hard for the heart to pump the blood throughout the circulatory system, it is foolish to take aspirin for cramps or headache, or to relieve the congestion of a cold, and keep on with one's active work. The least one can do is go to bed or keep quiet and make it as easy as possible for the heart to do its work while under the influence of the drug.

OVERDOSAGE may be recognized by blueness of lips and general pallor, prostration, and weakness.

TREATMENT consists in rest, warmth, and stimulation.

HYPNOTICS are drugs producing sleep. Perhaps the most commonly used class is that of the ethyl hypnotics: sulphonal, trianal, veronal (barbital), tetronal, medinal, luminal, amytal, and allonal. Hypnotics are powerful drugs and should never be used except under definite orders from a physician for each dose. Prolonged or frequent use may cause sudden collapse and death. Luminal is a strong and rapid hypnotic much used as a sedative in epilepsy and toxic goiter. Amytal is one of the mildest and safest of the ethyl group.

Drugs Which Affect the Digestive Tract.—*Digestants* are preparations which supplement the natural gastric juices, hydrochloric acid and pepsin, or stimulate the secretion of these. Persons who are subject to hyperacidity seek relief by taking *soda* or *bismuth* or *milk of magnesia* or other alkali to neutralize the excess of acid.

It is much better to eat a proper balance of alkali-forming foods (see page 83) and a generally balanced diet, and to chew the food thoroughly (see page 73) in order that the acid-forming carbohydrates may be partly digested in the mouth.

Regurgitation of bitter secretions ("heartburn") may occur with low gastric acidity, which may cause bile to enter the stomach. Alkalies will give no relief, and medical advice should be obtained.

Cathartics.—Probably man has abused no other organ as he has the bowel. As long as he eats he must get rid of food and tissue waste. With the progress of civilization living becomes more artificial and erratic. Having come up through the ages of evolution using only foods as found in nature, man abruptly begins to tamper with these—especially the cellulose—and his bowel finds itself without natural stimulus to action. Originally a creature of activity and freedom, he begins to shut himself away from the sun and spends much time in sitting, a position which in itself tends to interfere with free peristalsis and evacuation. In addition to all this he creates rigid and artificial schedules which may interfere with the establishment of regular habits in emptying the bowel. He even completely discontinues the natural squatting or crouching position which primitive people and many animals naturally assume for evacuation.

The widely disseminated popular educational propaganda on food and health is now slowly changing the general picture, but for years the manufacture and sale of cathartic nostrums have reached gigantic proportions. There is indication of lessened use as both the public and the medical profession become better informed regarding the essentials of healthful living.

Drugs producing evacuation of the bowels are usually classified in order of violence of effect as purgatives, cathartics, and laxatives. Fortunately drastic purgatives such as Croton oil, aloes, gamboge, and large doses of calomel are no longer used. Massive doses of cathartics or laxatives may operate as purgatives. Cathartics and laxatives differ chiefly in the size of the dose, a laxative being mild in effect.

Cathartics and laxatives may be classified as stimulant or irritant, hydragogue, and lubricant.

Stimulant or irritant cathartics are such as cascara sagrada, castor oil, phenolphthalein (a coal-tar preparation), small doses of aloin, calomel, senna, and rhubarb. All of these are habit-forming and should be used only rarely and in single doses. Calomel (mild chloride of mercury) in particular should never be taken except under doctor's orders.

Hydragogue cathartics produce watery movements by stimulating the production of an excessive amount of protective fluid secretions from the lining of the bowel. The salines or "salts" are the best known of this class. Those most commonly used are *magnesium sulphate* (epsom salts), *sodium phosphate*, and *magnesium citrate.* There are many proprietary and patented preparations of saline cathartics known as "liver salts," etc.

Salines produce speedy, copious, watery movement and are valuable when quick, complete emptying of the bowel is important, as when some poisonous or irritant substance has been taken or when it is necessary to bring down a high blood pressure or remove fluid from the body in dropsy. In excessive menstrual congestion with cramps a dose of saline the day before the onset of the period will sometimes speed up drainage and lessen the discomfort. The frequent or habitual use of salines is detrimental to the specialized and delicate mechanisms of the bowel and tends to aggravate rather than relieve constipation.

Milk of magnesia is an emulsion of magnesium which is mild, alkaline, and as free from harmful or lasting reactions as any such preparation can be. It is recommended for children and for pregnant women.

Lubricant cathartics comprise all oils such as castor oil (which is also an irritant) and, especially, the great number of preparations of mineral oil (liquid petrolatum). Mineral oil is an inert oil which is not absorbed by the intestinal wall and is unirritating. It produces emptying of the bowel merely by lubrication and softening of the fecal mass. The pieces of research which have been done in the effort to determine whether or not mineral oil interferes with the normal functioning of the bowel and its many important digestive glands have failed to agree in results, but it stands to reason that the constant coating of the bowel with a liquid oil (as large and frequent doses are necessary) cannot be wholesome. There is recent evidence that mineral oil

specifically prevents the absorption of fat-soluble vitamins A and D, through absorbing them and draining them out of the food mass. This presents a serious objection to the use of such oil. The chief use of mineral oil is in chronic inflammation of the appendix, when it is important to prevent the impaction of fecal matter in the blind end of the large bowel from which the appendix extends (see page 57). On the other hand, the deprivation of vitamin A (see page 86) when there is already a chronic infection is a very serious matter. Mineral oil is said to interfere with the secretion of bile and pancreatic juices and to diminish the nutritive value of any food with which it may be mixed.[2]

Mechanical Methods of Producing Evacuation.—Enemas (see page 306) empty the lower bowel by softening and flushing out fecal matter lodged in the sigmoid. The bowel soon becomes "conditioned" to depend upon enemas, and in time enemas create rather than cure constipation. The warm oil enema, as described on page 310, is probably unobjectionable and may be useful with children and chronic cases.

Rectal suppositories are cones or pencils of semisolid, oily, gelatinous, or viscid substance which are introduced into the rectum for giving medicine or producing evacuation. Suppositories of cocoa butter or gelatin are neutral and nonirritating, melt at body temperature, and are absorbed to a degree by the wall of the rectum. Medicine, particularly opiates after rectal operation, or drugs used in the treatment of hemorrhoids, are sometimes introduced in this manner to obtain a local effect.

Suppositories of glycerine jelly, soap, or other viscid substances are frequently used to stimulate the sensitive lining of the rectum and produce evacuation of the lower colon (sigmoid; see page 60). Occasionally evacuant suppositories under special circumstances are useful. Like all other artificial measures, however, the continued or frequent use of suppositories is injurious. The use of soap suppositories with infants and young children, even though recommended by some very good authorities in child care, is, in

[1] DUTCHER, HARRIS, GUERRANT, and HARTZLER, "The Assimilation of Carotene and Vitamin A in the Presence of Mineral Oil," *The Journal of Nutrition*, Sept. 10, 1934.

[2] *Medical Woman's Journal*, January, 1931. "Answers to Queries."

the opinion of this author, strongly to be condemned. The artificial stimulation or irritation of the very delicate, highly specialized organ, the rectum, tends to destroy the natural rhythmic adjustments of the child's body, rather than promote them. For immediate relief a warm oil enema (page 310), and for permanent correction careful regulation of health habits, is a much safer program.

Disinfectants are substances or procedures which destroy disease germs. It is a relatively simple matter to destroy harmful germs on inert objects by the use of heat (steaming, boiling, or baking), or strong chemical solutions (sodium hypochlorite, carbolic acid, or bichloride of mercury), or gaseous vapors (formaldehyde, sulphur, or cyanide). It is not so simple to devise ways of destroying harmful organisms in or about the living body without injuring the cells of the body. Progress has been made within recent years, however. Antiseptics may for the purpose of practical discussion be classified according to the part of the body which is to be protected or the specific use intended.

The Skin.[1]—The healthy, unbroken skin is highly impervious to the entrance of disease germs of all kinds. Indeed, it is almost a perfect protection. Many kinds of germs, however, may lie upon the surface of the skin, since it comes in contact with many contaminated objects every day. Any break in the skin, however small, is likely to permit the entrance of germs into the moist, warm underlying tissues and blood capillaries, whereupon the germs may multiply and set up activity unless promptly destroyed by some of the immunizing mechanisms of the body (see Chap. XVIII). The ordinary aesthetic care of the hands by scrubbing with soap, keeping the nails trimmed and polished and free from hangnails, and the skin soft and unbroken, is the best general protection from infection. Fastidious care in touching objects likely to be contaminated with harmful germs is also important.

In puncturing or cutting the skin, as in giving hypodermic injections or serum inoculations, in minor operations, or where there are scratches and abrasions it is necessary to kill the germs upon the surface and keep the cut surface sterile until completely

[1] RAIZISS, GEO. W., and others, "Metaphen as a Germicide and Skin Disinfectant," *Journal of the American Medical Association*, Apr. 19, 1930.

healed. The leading skin antiseptics in use at the present time are iodine, mercurochrome and alcohol.

IODINE.—The tincture of iodine is volatile and penetrates all irregularities of the skin such as gland and hair follicles, and is harmless when used in proper strength, although quite irritant to sensitive tissues and in strong solutions. It is apt to evaporate with age and may become sufficiently concentrated to blister. Old iodine should be diluted with a little alcohol. Iodine is useful when painted upon a small area or upon a scratch, small cut, or bruise. It is sometimes used to swab ulcerated tonsils or gums.

MERCUROCHROME, a nonpoisonous preparation of mercury combined with an aniline dye, is another valuable skin antiseptic which is also used on mucous membranes. It is slower in action and less irritant than iodine. Every home should have either iodine or mercurochrome for disinfecting small areas of the skin, and even the smallest scratch should be promptly covered.[1]

ALCOHOL in full strength may be used when the color of the other antiseptics named is objectionable, but alcohol is a less powerful germicide than these.

Antiseptics for the Eye, Bladder, and Other Sensitive Structures.—Most antiseptics are too irritant for use in such sensitive and delicate structures as those named. For general home use normal salt solution (one level teaspoonful to one pint of boiled water, which is about the saltiness of tears), is effective and nonirritant, and may be used for eye irrigation, gargles, vaginal douches, and enemas.

BORIC ACID is a nonirritating, mild antiseptic which is much employed in irrigating the eye, bladder, or other sensitive structures. It is usually used in 3 to 5 per cent solution, made with boiled water. Boric acid powder is sometimes utilized as a dry dressing for wounds, since it is readily soluble in water.

HEXYLRESORCINOL (S. T. [surface tension] 37) is a relatively new antiseptic which destroys bacteria by lowering the surface tension of their cell surfaces, causing them to disintegrate. It seems to be entirely nonirritating and nonpoisonous to human tissues. It is being used in the treatment of kidney, bladder,

[1] "Mercurochrome versus Iodine," A Symposium, *Journal of the American Medical Association*, Sept. 8, 1928.

and intestinal infections, also in the eye, nose, and throat. It seems to pass the stomach relatively unchanged. Its exact range of usefulness is not yet fully known.

SILVER NITRATE in very weak solution (1 per cent to 4 per cent) is used as an antiseptic in the treatment of the eye, and in very dilute solution, 1 to 1,000, in the treatment of the bladder and urethra. It is a specific antiseptic for the germs of gonorrhea, and most states require the attendant at the birth of any child to put one or two drops of dilute solution in its eyes at the time of birth. This is a "prophylaxis" (prevention) against gonorrheal infection, which without this precaution destroys the sight of many infants (see page 250).

In concentrated form (lunar caustic pencil) silver nitrate is used to burn off or destroy warts, small growths, and granulation tissue (proud flesh) in slowly healing wounds (see pp. 430, 433).

ARGYROL is a colloidal solution of silver with a protein base. It is nonirritating and is much used as a solution and as a salve in treatment of the eye.

METAPHEN is a combination or preparation made from mercury, coal tar, and other chemicals. It is a noteworthy chemical achievement in that it can be used internally, intravenously, as a disinfectant in the eye and in body cavities, and also on the skin and on instruments. Metaphen is proving to be a valuable agent in the treatment of internal infections.

METHENAMINE OR UROTROPIN is an artificial alkaloid which breaks down into formaldehyde and ammonia. It is quickly absorbed, appearing in the urine within a few minutes after taking. Because it forms formaldehyde in the urine it is strongly antiseptic in infections of the kidney and bladder. It may be highly irritating and should be used only under medical direction.

General Antiseptics.—Every homemaker should keep a large bottle of all-purpose antiseptic for washing wounds, sterilizing hands and equipment, etc.

SODIUM HYPOCHLORITE (Dakin solution) is one of the most useful and one of the more recently discovered antiseptics. Chloride of lime has long been used as a germicide in the disinfection of fecal matter or urine. Chlorine is a powerful germicide and is used in very dilute form as a destroyer of organisms in water supplies. Because the chlorine in chloride of lime is highly

volatile and irritating and escapes rapidly, the use of this compound has been limited. Realizing the potential value of the gas the chemists set to work to invent a compound which should liberate chlorine very slowly and which would not irritate living tissue. Dr. Dakin of the Rockefeller Institute of Medical Research was fortunate enough to succeed in this, and the neutral solution of sodium hypochlorite was named for him, "Dakin solution." He has since perfected another similar compound known as *Chloramine T*, which is much used in surgery.

Dakin solution tablets can be purchased and made up in solution at home, or the druggist will make up a solution. Many proprietary disinfectants using the Dakin formula with slight alteration are on the market. Sodium hypochlorite can be used to sterilize equipment, fabrics (it probably bleaches colors), hands, skin, wounds, and may be used in dilute solution as a gargle, in irrigations, etc. It must not be used in the eye or bladder or internally. Sodium hypochlorite has the special virtue of being inexpensive.

THE COAL-TAR ANTISEPTICS, carbolic acid (phenol), cresol, and lysol are much used and valuable. Phenol (carbolic acid) was one of the first to be used when Lister developed the germ theory of disease and proposed to combat infection by artifically destroying germs with antiseptic measures. These chemicals are highly irritant except in weak solution; they are offensive in odor and poisonous when taken internally. In *very* dilute solution they are sometimes used in gargles and vaginal douches. Their chief value is in disinfecting utensils, instruments, hands, etc. Lysol an account of its relative cheapness is sometimes used in the disinfection of fecal matter and urine, bedpans and toilets, as in typhoid fever.

BICHLORIDE OF MERCURY (corrosive sublimate) is a germicide which has had considerable vogue in surgical practice. Since it corrodes metals it cannot be used to sterilize instruments. It combines with albumin to form an insoluble precipitate, and hence is useless where there is pus. Its continued application is irritating to the skin. It is highly poisonous when taken internally. The only real use of bichloride of mercury is for disinfection of hands, operative surfaces, and wooden or enameled furniture. It cannot safely be used on open wounds, or in body

cavities, in sufficient strength to be germicidal, as poisonous absorption may occur.

The symptoms of poisoning are diarrhea, vomiting, and destruction of the tissues of the kidneys with suppression of urine, weakness, and collapse. There is little that can be done for such poisoning. If detected at once white of egg may be swallowed to coagulate with the mercury, then washed or pumped from the stomach.

Accidental poisoning was formerly so frequent that drug manufacturers generally adopted the practice of coloring bichloride tablets blue. One should always beware of blue tablets or solutions. The small bottles of tablets commonly sold to the public are made in curious shapes or with sharp pins in the cork to prevent their being mistaken in the dark for medicine bottles.

Peroxide of hydrogen (hydrogen dioxide, H_2O_2) has a very high oxidizing power; for this reason it combines with all oxidizable substances with the rapid liberation of carbonic acid gas (effervescence). This causes the solution to penetrate the smallest spaces, and it oxidizes disease germs with which it comes in contact while actively effervescing. Its chief use is for cleaning up suppurating wounds or ulcerated tonsils or teeth, or for cleaning out dirty, ragged, or deep injuries which are difficult to manage. Peroxide of hydrogen should not be applied repeatedly to a surface; it is debilitating to living tissues when so used. Peroxide of hydrogen deteriorates with age and must be kept in a dark place and in a dark bottle with rubber or glass stopper.

Picric acid (trinitrophenol) is derived from carbolic acid. It is an explosive yellow powder which dissolves readily in water and formerly had considerable vogue for dressing burns. It smarts on first application but is somewhat anesthetic later. Picric-acid gauze ("yellow gauze") is often found in first-aid kits. Like many chemicals it is poisonous when absorbed by the circulation and cannot be used on large surfaces. The kidneys are affected and serious destruction of red blood cells may result.

Nasal Antiseptics.—The wide prevalence of colds and respiratory infections in many regions creates an extensive need for antiseptics which may be used in the nose and throat.

Menthol, a volatile oil obtained from wintergreen and other mints, is dissolved in various oils and fats and is both antiseptic

and stimulating to mucous membranes. Formerly atomizers were commonly used for forcing water or oil sprays into the passages. Specialists now believe force should not be used because of the danger of driving infective secretions into the various tubular passages leading from the posterior nares (nose) to the middle ear, the antrums, and the frontal sinuses (see page 115). The nose should be swabbed with a cotton pledget on the end of a tooth pick or applicator, or the oil should be dropped into the nostrils while the head is thrown back (see Fig. 72). Nasal oils containing menthol or other pungent, volatile substance should not be used for infants or small children, as the passages leading from the nose (see page 116) are relatively short and large and the effect of such irritants is sometimes serious.

NOVOCAIN (see page 358) EPHEDRINE and ADRENALIN (EPINEPHRIN) (see page 196) are used to shrink the congested membranes and open up the breathing passages, thus making treatment more effective. Combinations of ephedrine with nasal antiseptics in oils are now on the market and are commonly used in the treatment of colds. Novocaine or adrenalin should never be used except by a physician, and ephedrine should not be used continuously or in chronic conditions except under a physician's advice.

EPHEDRINE is a vegetable alkaloid derived from a Chinese plant, Mahuang (ephedra vulgaris) which has been used medicinally in China for 5,000 years. Besides being a mild cerebral stimulant and in suitable dosage serviceable as an antidote in poisoning from morphine, chloral, and barbital, it may also be used in asthma, although epinephrin is probably more effective in treating attacks.

Mouth Antiseptics.—Mouthwashes of many kinds are on the market and are kept in most homes. Most of them have an alkaline base with the addition of pleasant volatile oils, coloring matter, and flavoring. In general they are mildly antiseptic and their use is probably to be commended as a routine habit. They should not be depended upon as gargles or nasal washes where active infection is present.

Sulfanilamide (Prontosil, Prontylin, Rubiazol).—This is a new germicide which has recently been introduced into medical practice in this country. It seems to be specific against the various forms of hemolytic streptococci (page 179) such as those

causing scarlet fever (page 204), puerperal septicemia (childbed fever), and also against the cocci causing gonorrhea (page 250), and several types of pneumonia.

Sulfanilamide is effective when taken by mouth and does not produce marked physical reaction. Just how it acts upon the streptococcic germs is not known but the results reported are spectacular. Much remains to be discovered concerning its character and its use, but it seems certain that it provides a remedy for a large group of the most serious diseases known to mankind.

References

DEES and COLSTON: "The Use of Sulfanilamide in Gonococcic Infections," *Journal of the American Medical Association*, May 29, 1937.

MELON, GROSS, and COOPER: "Sulfanilamide and Prontosil in Hemolytic Streptococcus Infections," *Journal of the American Medical Association*, May 29, 1937.

"Mercurochrome versus Iodine," a symposium, *Journal of the American Medical Association*, Sept. 8, 1928.

MUSE, MAUDE B.: *Materia Medica and Pharmacology for Nurses*, W. B. Saunders Company, 1933.

New and Unofficial Remedies, Report of the Committee on New and Unofficial Remedies, American Medical Association Press, 1935.

RAIZISS, GEO. W. and others: "Metaphen as a Germicide and Skin Disinfectants," *Journal of the American Medical Association*, Apr. 19, 1930.

Report of the Council on Pharmacy and Chemistry, *Journal of the American Medical Association*, May 29, 1937.

SHERMAN, H. C.: *Food Products*, Appendix A, The Macmillan Company, 1933.

WILBERT, MARTIN I.: *The Limitations of Self Medication*, Public Health Reprint, No. 256.

CHAPTER XXXV

SPECIAL PROBLEMS IN NURSING

Nursing Infants.—Sick infants present special problems (1) because of their helplessness; (2) because of their inability to talk and make their feelings known; (3) because infants react to conditions, such as drugs, treatments, diseases themselves, and to external conditions, temperature, etc., differently from adults and also may react in unexpected ways. For these reasons caring for a sick infant involves extreme watchfulness as to symptoms of disease, reaction to treatment, and the general comfort.

The home nurse should observe the following points in her care of an infant.

1. He should be kept in a light, airy, quiet room and under the same conditions as are desirable for a sick adult. Although the baby cannot express discomfort he is even more susceptible than an adult to confusion, stale air, and noise. He may not understand conversation, but nevertheless he is fatigued by listening to talking.
2. He should be placed on a smooth, wide bed—an adult's bed is better than a crib because it is then much easier to handle the child and watch him, and also because he can move more freely.
3. He should wear little or no clothing in order to minimize handling and make it possible easily to observe his body. He should be kept warm with lightweight covers rather than with clothing.
4. An infant should be handled as little as possible and that with the utmost gentleness and quietness. More than with any other age, the nurse of an infant needs to be poised, relaxed, and quiet. All her movements should be smooth and free from tension and jerkiness. She should be able to handle a sleeping infant, change a diaper, and even take a rectal temperature without waking him.
5. The position of a sick infant should be frequently changed and the surface under its body kept smooth. The bedding becomes very hot, especially with fevers; the baby's skin is hypersensitive to small irritations such as wrinkles or crumbs. The nurse should turn him now and then from side to side, exposing his back to the air. Very gentle massage with the flat, flexible hand is usually permissible and is very restful to the tired muscles.

6. Daily bathing, fresh air at all times, and sunshine with protection of the eyes from direct light are as important with an infant as with an adult.

7. Practical points in treatment of an infant include the following:
   - *a.* Carry out all physician's orders with great exactness, but watch the infant's reaction closely. It is well to ask the physician what results he expects from medicines and what are the signs of over-reaction. Also, it goes without saying that one should never administer any treatment whatsoever without the physician's knowledge and approval.
   - *b.* Study the technic of giving food and water. A sick baby may be too weak or too apathetic to draw on a nipple and may have to be fed with a spoon or pipette. In such feeding the infant's head and shoulders should be raised on a pillow and the fluid should be trickled slowly into the side of his mouth in such a way that it runs under the tongue rather than over it. The swallowing reflex is thus stimulated without any danger of tickling the palate and causing strangling, as easily happens with an uncooperative or unconscious person of any age.
   - *c.* Give special attention to the intake of water. This is of the greatest importance in preserving the blood volume and chemical balances, which we have learned are so important to bodily health and repair.
   - *d.* Give special attention to elimination. Perspiration and urination should be watched and accurately reported on the bedside record. When it becomes necessary to produce movement of the bowels, it should be done with the least possible disturbance of the patient. A good method is to place the infant on a pillow with the head very slightly elevated and with the hips at the lower edge of the pillow; a rubber sheet, raincoat, or other protector is placed (covered with a towel) over the end of the pillow and extending over the bed or table. A hand basin is placed against the edge of the pillow in such a manner as to catch the enema fluid. One person supports the legs of the infant, (which tend to be drawn up), the nurse then administers the warm oil, soapsuds, or normal salt solution as described on page 310. This should be carried out so very gently that the patient is scarcely conscious of it; in fact a good nurse, as has been said, will scarcely waken a sleeping infant.
   - *e.* If it is necessary to apply heat or cold the nurse must keep in mind the extreme sensitiveness of the infant's skin and nervous system to irritation and to shock, and she must not suddenly apply extremes of temperature, either hot or cold. Explicit directions should be obtained from the doctor (who will, we hope, be a specialist with children of his own and will himself be fully aware of the delicacy of the infant's reactions).
   - *f.* If it becomes necessary to administer medicine, or treatment, or to make an examination by force, the nurse must not struggle with an infant or try to hold it with her hands. It should be wrapped from

neck to feet in a bath towel, then, for an examination or treatment of the eye, ear, or throat, the nurse can hold the infant's head against her chest in a favorable position without bruising the tender flesh by trying to hold its body with her hands (Figs. 117, 118). If medicine is to be given by force, it should be well diluted and trickled very slowly under the tongue with a pipette, while the child is held on the lap, wrapped as described.

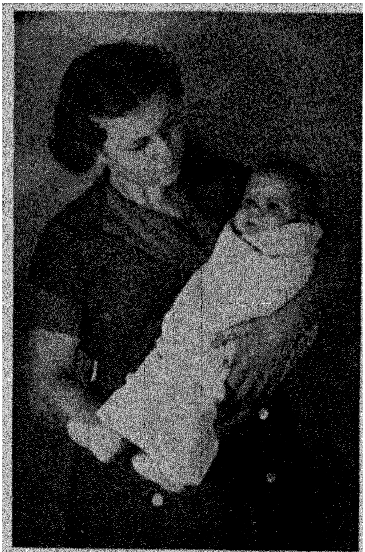


FIG. 117.

g. If the infant has an itching eruption and it is necessary to prevent scratching, padded, loose pasteboard cuffs may be fastened over the elbows to prevent bending the arms, or the hands may be padded with cotton and bandaged. Every effort should be made to allay the itching by bathing with soda water, using soothing ointments, etc., as approved by the doctor. Freedom of movement should not be restricted unless absolutely necessary.

Nursing Runabout Children.—The outstanding problem with the young child is control, and much will depend upon the previous

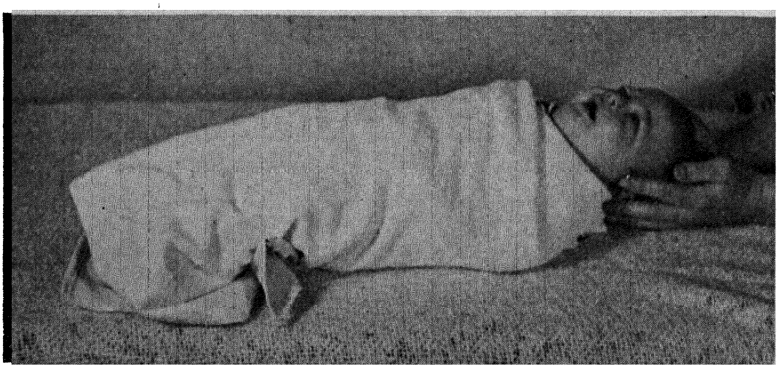


FIG. 118.—An infant restrained for examination or treatment.

discipline and the usual cooperativeness of the child. It is difficult radically to recondition a child under the stress of an

illness. The very life of the child, however, may depend upon the success of the nurse in securing cooperation without the use of force.

Another outstanding problem is providing occupation and amusement for the convalescing child, who must be busy every moment or he is unhappy and difficult to manage.

Illness at any age involves unpleasant experiences: taking medicines which do not have an agreeable taste; submitting to painful or frightening examinations or treatments; enforced quiet in bed; deprivation of foods and activities which the child enjoys—all are trying experiences at a stage of development when the child has no adequate conception of the reasons involved and when he is still very much a creature of impulse.

The basic principles in control of the sick child (or any other) include, especially, quiet self-control on the part of the nurse coupled with firm expectation of cooperation. The nurse must never lose her own temper, or coax, scold, or bribe. She must have a clearly defined policy and carry it out with good humor and firmness. Any child recognizes a will stronger than his own just as quickly when it is quietly manifested as when the adult makes a great noise and a great show of force. The nurse should never show excitement in the form of irritation, worry, or anger. The necessary regimen should be carefully explained to the child in terms he can understand. He should be told that he is sick and that sick people always stay in bed and have the doctor. If he is not too ill to respond he may be quite interested in the idea of being sick and doing a lot of queer new things such as being visited by the doctor (and everybody does what the doctor tells him to do), having trays of food served in bed, taking funny medicines (maybe as Johnnie did when he had measles), and having a great deal of mother's time, etc. A child of four or five will even enjoy planning the stories he will have to tell his playmates.

If the doctor understands children and if the family have been careful not to create fears of doctors and treatments, the child will look forward to the doctor's visits and will readily agree to carry out his orders even though he finds this subsequently difficult!

Above all no child should be governed through fear. He should never be told he will die if he does not mind the doctor, or

threatened with punishment. Fear is in itself as injurious as illness, and every effort should be made to keep the mind of the child as serene as possible.

The program of medication, treatment, and feeding (if restricted or special) should be explained to the child to the extent that he can remember or comprehend. It must then be carried out with the least possible discomfort or disturbance. Medicines

FIG. 119.—Restraining an older child for treatment to the ear.

FIG. 120.—Restraining an older child for treatment to throat.

should be given so (see page 353) as to minimize the disagreeable taste. Treatments should be given quickly and skillfully. Bungling technic in giving an enema, swabbing a throat, irrigating an ear, or dressing an injury may cause a highly unnecessary amount of discomfort and pain, with perfectly natural consequent resistance and dread of recurrence.

If it becomes absolutely necessary to use force it should be done promptly and effectively and entirely without show of temper or irritation on the part of the adult (Figs. 119 and 120).

Any such procedure should be gotten over with quickly both on account of the mental effect on the child and in order to minimize the physical strain and exhaustion which are always very harmful in any illness and at times may be serious.

Variety, palatableness, and attractiveness in serving food are exceedingly important with a child, particularly if he must eat certain things he does not care much for and be deprived of things he thinks he wants. This applies with special force to the serving of milk, which is so very important in the diet of any child (see page 324).

A resourceful imagination may find ways of making even obnoxious medicines go down. Gaily colored pictures of fish, picking out the one which is to furnish the cod-liver or haliver oil at each dose; a story about the mining and preparation of magnesium with a graphic make-believe of a package coming by train to the druggist, his weighing and wrapping, the coming of the delivery boy, etc., may turn taking a dose of oil or salts into quite an important adventure!

When it comes to the entertainment and occupation of a convalescing child the nurse needs all the ingenuity and resources at her command. She must keep in mind that the child tires easily and must not give prolonged attention to one thing. The nurse must know when the child has looked at books long enough and put on an interesting victrola record or read a quiet story or poem, letting him respond passively for a time. Then her charge may play a game or dramatize with dolls or pegboards, or construct or build, but the first sign of weariness must be noted (see Chap. XXXVII).

Nursing the Aged.—The specific problems in nursing the aged attach to the physical and mental changes of old age.

Physical Changes of Old Age.

1. The aged commonly experience a slowing down of all the body machinery. The glands of internal secretion are not so active as formerly. This means that circulation, digestion, muscular activity, and nervous control are all enfeebled. Diet, clothing, work, and all other conditions need to be adapted to this change.

2. The bones of the aged are brittle, owing to an alteration in the proportion of lime to organic matter. Great care must be exercised at all times to guard against falls. This is especially necessary on account of the clumsiness which comes with slow nerve response.

3. The senses of the aged are usually dulled, even though occasionally, sight, smell, and hearing remain keen until extreme old age. Special care is necessary in order to register impressions accurately, and it takes great patience to wait on the slow responses.

Mental Changes of Old Age.

1. Reversion to Traits of Childhood.—"Once a man, twice a child," is at least partly true. Reason and higher processes of thought naturally become dulled when the more recent association paths are subjected to the erasing process of age. For this reason conversation should be simplified to the understanding of the particular old person in question. It is a mistake to talk too simply, however, for this is a great affront to most aged persons. Some lose their grasp of practical affairs but retain a remarkable ability in discussing abstract or theoretical subjects. This type of old person is apt to be very dogmatic and sure he is right in matters of politics and religion. It is a mistake to argue with such a person and also quite useless, as he cannot change his opinion. He is quite convinced that years have given him wisdom and that all who disagree with him are wrong. Children also are obstinate, but for the opposite reason, that they lack sufficient experience to realize that there can be another way of thinking.

The aged are often inquisitive and prying with a curiosity similar to that of some children. This trait is particularly wearing and best dealt with by ignoring the inquisitiveness, but one should keep a serene manner and show no impatience.

2. Loss of Memory.—The aged commonly forget the immediate events of their lives but recall with new vividness the events of early life. They will declare they have had no food all day, quite forgetting that they have breakfasted or dined, but will relate in great detail what they had to eat on a certain occasion 60 years before. Old people should not be expected to remember, and those associated with them must keep sweet under the drip of ceaseless reiteration, and must expect to repeat requests and necessary statements many times and to deal with reiterated demands.

Nursing the Aged in Illness.

1. The Need of Extra Warmth.—The aged have a very great fear of cold. They may object to bathing or changing apparel on the ground that they will "take cold." The nurse should remember that they cannot wrap themselves closely in the bedding and that the old body cannot warm cold sheets. Warm nightgowns, bed slippers, or stockings will be needed in cold or chilly weather. In winter it may be necessary to use woolen blankets or flannel sheets instead of cotton sheets, and the nurse should always tuck the bedding closely about the body. Extra care will be necessary in giving either bed or tub baths to guard against chilling. The water should be quite warm and the body should be quickly covered and thoroughly rubbed. Hot-water bottles and other sources of artificial heat should be used when

necessary for cold feet or to warm the bed, but the constant use of these tends to debilitate the tissues. It is better to keep the patient warm with lightweight woolen blankets and warm gowns and stockings when possible. The temperature of the room should not be kept excessively hot, neither should it be cold. Fresh air is as important to the old as to the young. The tactful nurse will be able to keep fresh air coming in by promising that there "shall be no drafts." There will need to be some means of accessory heat for cool mornings and evenings and rainy days, even in summertime, and a very old person should never sleep in a cold room in winter.

2. Feeding the Aged.—The food needs of the aged are proportionately less than at any other period in life. In the main they should return to childhood's diet of milk, cereals, fruits, and vegetables. Very little meat should be eaten, because the body does not require it, because excess of nitrogen waste is dangerous for the kidneys, and because the teeth are usually impaired and the old person is apt not to chew well. Old people are often capricious about their eating, and desire and demand things not good for them. It is cruel to deny them tempting food if it is served to others in their sight. The family table must be more or less adapted to the needs of the very young and very old members of the household. Since this means chiefly the exclusion of heavy meats, rich desserts, and warm breads, it will not work a hardship upon the rest of the family. In feeding the aged invalid apart from the family the nurse may have to deal with the old person who eats very little and must be urged to eat enough to maintain his strength or the old person who eats ravenously and must be tactfully restrained. The tray of the latter must appear to be filled with food, or he will feel himself to be abused; he will brood over the matter and may assign the reason to a desire to be rid of him or to a motive of economy. The tray may be filled with large servings of fruit, toast, and tender vegetables, and the meat when served may be cut very fine and so arranged as to appear more than it really is. Milk served in a small pitcher with an empty glass beside makes this item seem more generous. Slicing the bread very thin helps in giving the impression of a liberal allowance. Chewing should be encouraged, but if the teeth are missing or in bad condition everything will have to be cut in fine pieces. It is a mistake even with the aged to soften all food with liquid. It is better for digestion if the food is ground, even with toothless gums, and some persons learn to chew very well with the hard gums after the teeth are all gone. Old people should have their favorite hot drinks to any extent within reason.

3. Care of the Skin.—The aged are especially likely to develop bedsores which may occur during even a brief illness (see page 298 for prevention of bed sores).

4. Change the Position.—The position must be changed frequently both because of the pressure upon the skin and also because the aged easily contract pneumonia and other organic diseases from the congestion occasioned by gravity, pressure and defective circulation. The aged also become inexpressibly weary of monotonous surroundings and greatly appreciate

being lifted to a chair before a window or being wheeled or carried into the open.

5. Occupation of the aged is essential to contentment and mental health. Old people should be made to feel that they are still useful (see Chap. XXXVII).

Nursing the Crippled.—The hampering of a normal mind and a body normal save for one or more useless parts is the problem presented by the crippled. Both the physical and mental problems are very definite. The position must be changed frequently. Muscle tire becomes agonizing. A skillful nurse in a chronic case will develop a routine suited to the case, and this will relieve the patient from having to ask to have one part after another moved. The nurse will move the body as necessary to preserve comfort. A variety of cushions and "doughnut" rings add much to comfort. Even a broken or fractured limb is rested by having the sheet pulled smooth and tiny cushions tucked around to relieve the points of greatest pressure. Bits of surgical cotton sprinkled with talcum powder may be tucked inside the edges of splints and casts to relieve chafing. Cripples should be encouraged to use every usable part of the body, and devices should be arranged for enabling them to move and turn themselves.

Those responsible for a chronic cripple should occasionally consult specialists and experts, especially if the cripple is a child, because medical science is making such rapid advances that new and better methods of treatment may become available. Great care should be taken to avoid quacks and charlatans. Never go to the doctor who advertises.

Children crippled with infantile paralysis should go where the mother or nurse may be taught the newer methods of muscle education. This may make the difference between a life of helplessness and one of freedom and independence (see page 218).

Wholesome, useful occupation should be provided for every patient able to do anything. Those chronically lame can nearly always use some part of the body, and should have a diversity of useful, interesting things to do. The patient who must lie on the back but who can use the hands can follow special lines of activity and can even earn something. If the arms are helpless one can still read with the help of a tilted reading stand and a carefully adjusted light. Persons who have lost both arms have found

diversion in educating the feet, and have actually learned to write with a pencil placed between the toes. Anything is better than idleness, and every effort should be made to keep chronic patients busy. It should be made a game to see how far a patient can get along without the defective member. This applies not only to the loss of the use of an arm or leg, but also to the loss of sight or hearing (see Chap. XXXVII).

CHAPTER XXXVI

IMPROVISED EQUIPMENT FOR THE SICK ROOM

Intelligent modern homemakers will give due thought, as has been said, to the fact that illness and emergencies occur in every home. A minimum of essential equipment (see page 280) should be established and kept in order. Since both space and money are serious considerations in many families this equipment should be minimal. The resourceful homemaker, when she must function as nurse, can, by clever substitutions, get along with very little hospital equipment. Suggestions are here made for certain improvisations. The student and the homemaker are urged to collect additional ideas from all possible sources and preserve these in a notebook, card file, or by other orderly method.

Improvisations in Furnishing.—*Heat* for a room not connected with a central heating system may be supplied by an electric or gas stove or a carefully tended oil heater. A small airtight wood stove may be furnished with a stovepipe, which may be carried out of a window in the absence of a chimney. A piece of galvanized iron may be fitted above the lowered upper sash with an opening to fit the pipe. An elbow on the outside will be necessary to create a draft and carry away the smoke.

The Bed.—In case of illness, when there is not in the house a narrow bed or one suitable for an invalid, a folding cot of any sort, but preferably one with flat-linked springs, may be elevated to a convenient height by boxes under the ends (Fig. 121) or by placing a wooden block, sawed from a 6 by 6 beam, under each leg (Fig. 122), as described on page 278. Even a canvas cot can be made quite satisfactory by proper padding. If a cot without upright ends must be used (as may occur in a camp) the mattress will need to be tied at the corners to prevent slipping. Stout strips of cloth or bandage may be pinned to the corners of the mattress with large safety pins. A canvas cot will be more comfortable if it is covered with folded blankets and comforts rather

than with a mattress. These should be folded very carefully to fit the cot and stretched smoothly, then pinned firmly together with large safety pins and tied at the corners to the legs of the cot (Fig. 121). The under sheet should be folded about and under this improvised mattress, and included in the corner ties. The draw sheet must be folded under at the sides without making wrinkles under the patient, as small irregularities will be perceptible through the thin padding.

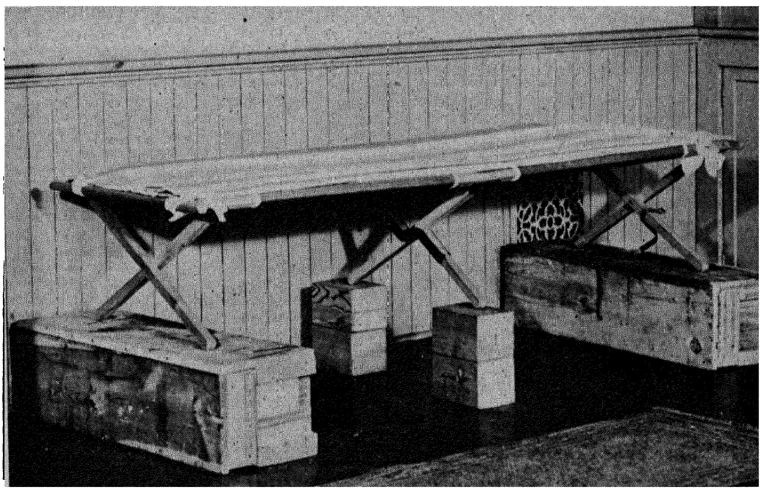


FIG. 121.—A canvas cot elevated on boxes and padded with folded blankets which are tied to the corners and middle of the cot with strips of cloth pinned to the blankets with safety pins. The under sheet may be included in the pinning.

The Bedside Table.—Having achieved a comfortable bed set at a height convenient for the home nurse, it may become necessary to improvise a bedside table. A wooden packing box of suitable height may be covered with a towel or table cover. In case of prolonged convalescence it may even be fitted with shelves and provide storage for books and occupational material. If paper boxes are more readily secured, one may be inverted over a second box to provide the proper size and height (Fig. 122). A low coffee table or other small table may be placed upon a box to bring it within the patient's reach.

The nurse's table may be any sort of table which is not so large as to be in the way. The home nurse must have a place to keep the bedside record, thermometer tray, medicines, etc. A wide window sill, or a desk shelf or mixing board clamped under the window sash, might serve in a very temporary illness. A small desk is quite ideal; an assemblage of boxes may be used in an emergency.

The nurse's cot may be any couch or cot which is available and movable. In a pinch a mattress may be placed on three or four pairs of chairs.

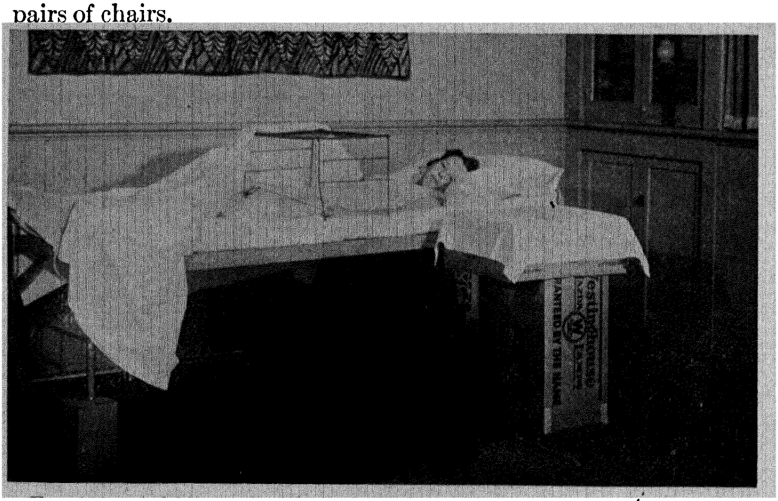


FIG. 122.—A folding cot with flat-linked springs elevated on blocks. A bedside table improvised from a flat box inverted over a tall box. A picnic grill is used to lift the bed clothes from the abdomen.

A mop stick tied to a bed post may be used to suspend a douche bag (Fig. 105).

To take care of nasal and throat secretions a grocery sack, with the top turned over as a cuff, may be pinned to the mattress to receive the paper handkerchiefs as used (Fig. 105). A cone of newspaper may be attached to the bed in the same manner. In place of paper napkins, Kleenex, or paper handkerchiefs, squares of toilet paper or squares of old muslin may be used. The supply may be placed in a box-lid or small tray to prevent scattering.

A back rest may be made of an inverted straight-backed chair, of a suitcase, a washboard, or leaves from a desk, etc. (Figs. 114 and

123). A simple permanent support which will not slip may be made from two boards hinged together.

A lap table may be made from a wooden packing box, a corrugated paper box, or piles of books with a desk shelf (Figs. 114 and 123). An ironing board of suitable height may be brought over the patient's lap.

A tray may be improvised from a mixing board, a drip tray or broiler tray from a gas stove, a framed picture, or a box lid (Fig. 113).

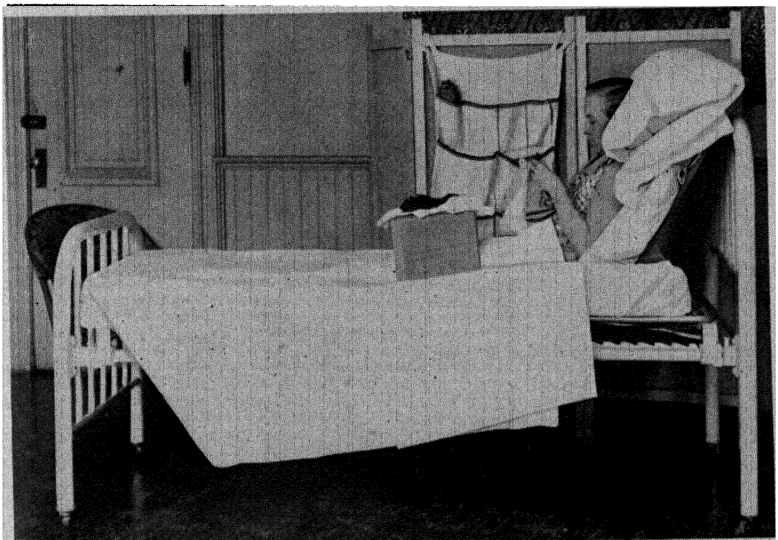


FIG. 123.—Desk leaves used as a back rest, a lap table made from a corrugated box; a set of utility pockets hung on a bedside screen.

A bedside commode may be improvised from a packing box; a back rest should be added. Unless the edges are very smooth a pad should be made to fit the seat (Fig. 103).

For a drinking cup or drinking tube a small teapot, cream pitcher with suitable spout, soda-fountain straws, or a few inches of rubber tubing may be used.

A wheel chair may be quickly improvised by strapping roller skates under the rockers of a chair (Fig. 124), or made from the chassis of a child's wagon.

Devices for Applying Water and Artificial Heat and Cold.—Devices for applying artificial heat and cold may be made from

sacks of denim or other firmly woven material half filled with sand (washed free from dust) or with salt. The edges should be double-stitched. A galvanized refrigerator can or water bottle, with good washers in the screw top, answers the purpose of some situations very well. Stone jars, large vinegar or cider jugs, or heavy pop bottles closed with rubber stoppers, electric or other laundry irons heated and wrapped, all make good bed warmers, but do not fit closely to a painful surface (Fig. 107).

FIG. 124.—A wheel chair may be improvised from roller skates.

Sections of inner tubing from an old automobile tire may be closed by rolling or folding the cut edges and clamping with paper clips placed closely together. These are particularly good for holding pounded ice (Fig. 107). Crushed ice may be placed in a rubber bathing cap, which is then drawn together and closed tightly with a rubber band (Fig. 109). The sleeve of an old rain-coat may be so used. For an ear or an eye a rubber glove may have the fingers telescoped into the palm, which is then partly filled with finely crushed ice and closed at the wrist with a rubber band.

Electric light bulbs attached to extension cords have many uses. A small bulb may be placed inside a round cereal box from which the bottom has been removed and the cover slit to fit the wire. This held over an ear gives a very penetrating warmth (Fig. 109). Electric lights may be attached to various improvised supports and placed over a knee or foot, or even over the entire abdomen. The support may be made from barrel hoops, corrugated boxes, coat hangers, etc. (Fig. 110).

For applying moist heat a wringer may be improvised from a small towel (Fig. 111). For large compresses or stupes, sticks or rulers may be run through the hems of a stout piece of canvas (Fig. 112). To prepare large packs for the abdomen or large joints, or the entire body, large bath towels and a common laundry wringer and tub may be used.

An Improvised Inhalation Apparatus.—A croup tent may be quickly made by placing an open umbrella over the head of the child with a blanket thrown over it. Steam may be conveyed to the inside of the tent in various ways. The child may be propped up with a lap table in front of him, and hold his face over a deep basin half full of actively boiling water, set in a larger basin to guard against possible splashing; this should be replaced by others in succession, with great care not to burn the child with spilled water. If any sort of heat unit can be brought to the side of the bed, such as a Sterno lamp, electric or gas plate or an oil burner, a teakettle may stand upon this with the spout directed under the blanket. If the kettle cannot be placed quite near enough for this a paper funnel or a rubber or pasteboard tube may carry the steam from the spout to the tent. If no portable heating apparatus is available the boiling kettle may be brought to the tent and, when the water ceases to steam, hot metal objects may be dropped into the water. An electric coffee percolator may be used to produce steam, or used as an inhalator in case medicated vapor is used. If the child is old enough to cooperate he may hold a rubber tube in his mouth, the other end of the tube resting in the top of a pitcher of steaming water tightly covered with a folded towel. This conveys warm, moist air through the bronchial tubes without the heat and discomfort of having the head covered.

Medicated inhalations are sometimes prescribed in bronchial pneumonia and asthma. This treatment may be accomplished

by means of the croup tent as described, or it may be more simply managed by placing a two-pound coffee can, containing the boiling water to which the prescribed drug has been added, in the bottom of a large strong paper bag. The patient then fits the top of the bag tightly about the face. Cutting out a small piece from one side of the top of the bag to fit the face may make it possible to sit in a more comfortable position than when one bends over the opening. A cloth thrown over the head and lap may help to concentrate the vapor. A paper funnel may be fitted about the spout of a teakettle and the large end fitted about the face, or rubber tubing may be used.[1]

FIG. 125.—A sheet may be draped toga-wise and serve as a surgical apron.

See page 300 for improvised irrigation pad for giving irrigations of the bowel or vagina, or for washing hair. See page 316 for improvised arrangements for a head rest in giving baths (Fig. 106).

Improvised Equipment for an Emergency Operation.—*In place of an apron or smock* a freshly laundered sheet may be used as follows: Hold the sheet up so that the middle crosswise crease will drop from chin to feet of the person who is to wear it. The sheet is folded over at the top so it will just clear the feet at the bottom. It is then brought smoothly around under the arms and the upper corners crossed in the back and brought over the shoulders and pinned to the front; that is, the right upper corner of the sheet is pinned to the fold in front of the left shoulder, and the left upper corner in front of the right shoulder. This can be done in such a way that part of the sheet falls over the sleeve and arm. With the sheet properly adjusted one can move around as

[1] See OLSEN, *Improvised Equipment for Home Care of the Sick*, for illustrations.

freely as if wearing a real apron (Fig. 125). A freshly ironed kitchen smock, nightgown, or nightshirt may be used.

A surgeon's mask and cap may be made quickly from a straight piece of cloth long enough to cover the entire head, with an opening for eyes (Fig. 179).

Instruments may be sterilized by placing them in a wire frying basket or a colander and submerging them in boiling water. A pressure cooker makes an excellent sterilizer for dressings or instruments. Sheets, blanket, dressings, towels, and other supplies may be quickly sterilized by ironing on both sides with a very hot iron, then pinning them up in squares of old muslin or in pillowcases which have also been freshly ironed. Cool sterile water may be obtained speedily by boiling water in several teakettles, plugging the spouts with sterile cotton, and setting the kettles in a cold place or in cold water.

An operating table may be extemporized from an ironing board for an infant or small child, or from a dining-room table for an adult. The dining table should have the extension leaves put in place and be wiped free from dust, then washed with an antiseptic. An ironing board may be used for an instrument table. It should be washed with an antiseptic solution and covered with freshly ironed towels. Clothespins of the spring type may be boiled and used to fasten sheets and towels in place or even used as forceps for handling instruments and dressings.

Newspapers may be spread about to protect the floor. An open newspaper should be placed on a chair to receive surgical sponges, dressings, or other materials which are to be burned.

The bed for an operative patient should be thoroughly warmed with jugs, bottles, and cans of hot water. These should be removed before the patient is placed in bed. A towel is spread over the usual location of the pillow and a small vegetable dish or enameled basin placed at hand to be used in case of vomiting or expectoration.

A strong light for an emergency operation at night may be managed (in the absence of electric light) by hanging the best light available in a favorable spot and carefully focusing with a small mirror or a bright silver or chromium dish or tray behind the lamp to throw the light upon the operative field. An ordinary type of kerosene lamp can be anchored with several wires about

the burner and hung on a nail driven in the desired spot (Fig. 126). With certain anesthetics there is danger of explosion if the fumes come into contact with open flame. The lamp may have to be placed at some height and distance for safety.

An electric bulb may be placed in a cylindrical box or can, such as a two-pound coffee can with bright interior, and held by an assistant in such a way as to focus the light strongly upon the field of operation and at the same time protect the eyes of the surgeon from cross lights. An ordinary oil lamp may be shaded

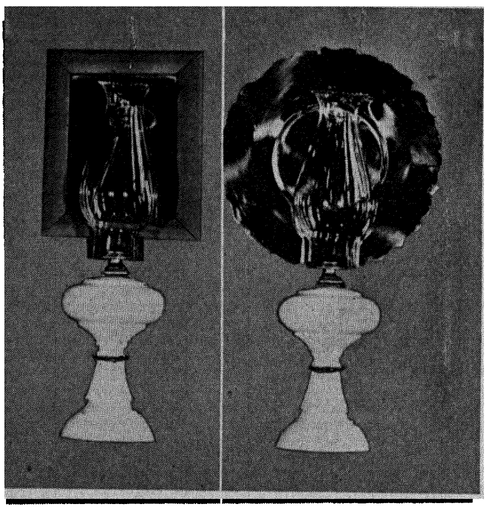


Fig. 126.—Lamps hung on nails by wires about the burner and standard and having improvised reflectors.

and held by an assistant in such a way as to direct the light upon the proper spot. A small mirror may be used as a reflector.

After the patient is placed in bed the field of operation may be protected from pressure and the weight of the bedding by an extemporized "cradle" made from three sides of a box, two halves of a barrel hoop crossed and wired together, a wire camp broiler (Fig. 122), coat hangers wired together, or anything which will be of convenient size and shape.

After an abdominal operation the knees should be flexed and supported by a pillow tightly rolled and tied about with a bandage, or pinned with large safety pins (Fig. 105).

Support for Affected Parts of the Body.—The feet in case of a paralytic condition known as "foot-drop," a cast about the knee, or in marked weakness will need to be supported at right angles for at least part of the time in order to relieve the strain upon the ankle. Two boards each approximately 12 inches wide and 12 inches long for one foot or 24 inches long for both feet, nailed together at right angles, or two sides of a corrugated box, should be well padded with cotton and placed under the feet with the soles of the feet resting against the upright side. It may be necessary to place "doughnut rings" under the heels. A broken arm or leg may be suspended in a cloth sling from a pole supported at the ends by the head and foot of the bed and tied in place to prevent slipping. "Doughnut rings" made from cotton wound firmly with bandage may be made in sizes suitable for elbows, heels, shoulder blades, or hips. Circles of cloth may be stitched and filled with cotton, sawdust, or bran (Fig. 107).

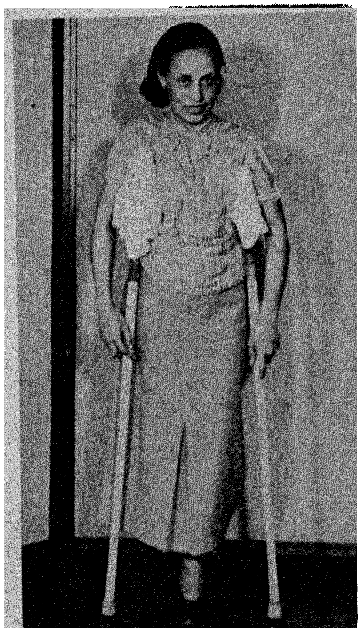


FIG. 127.—Crutches improvised from a pair of old brooms with brush cut off and padded with towels and crutch tips added.

A convalescent or a chronic invalid often needs help in moving about for comfort. The pole described above may be used by the patient to pull upon in changing his position, and may provide a place for hanging occupational material within reach. A stout rope, having a loop wrapped with a towel for a handle, may be fastened to the head or to the foot of the bed (Fig. 109). If attached to the head the patient may pull himself up in the bed when he has slipped toward the foot. A rope so placed also aids in turning. If it is attached to the foot the patient may pull himself into a sitting position. A trunk strap may be buckled to the head or to the foot of the bedstead. A small box placed in the

foot of the bed enables a patient to brace his foot against it and push himself up.

Crutches may be improvised from a pair of old brooms with the brush cut off and padded with towels (Fig. 127). A pair of rubber crutch tips should be added. Convalescent invalids may have books and magazines supported as shown in Fig. 128.

Preservation of Food.—In situations in which refrigeration is not available ways of keeping perishable food cold will have to

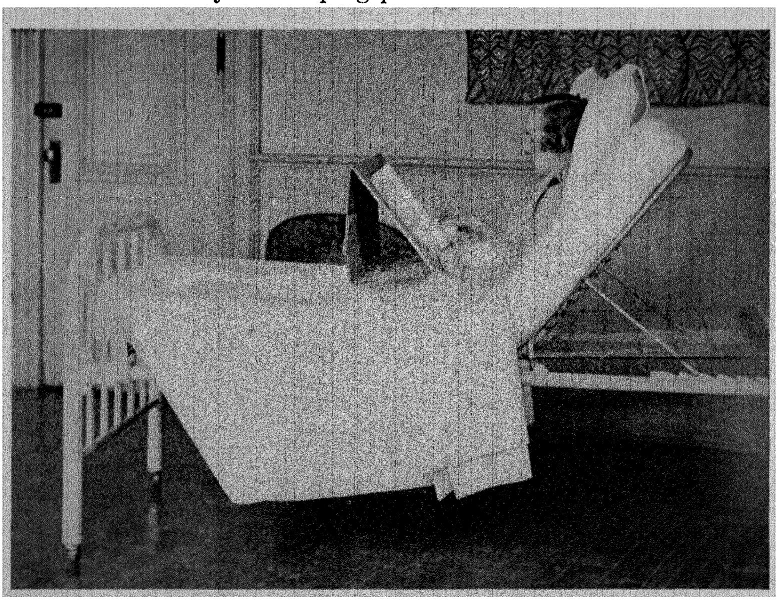


Fig. 128.—Supporting book or magazine with part of a corrugated packing box. The book is tied in place.

be improvised. If a small amount of ice can be secured it can be husbanded by putting it in a fireless cooker and placing the bottles of milk, etc., about the ice. Any tightly closed jar or box may be hastily insulated with heavy blankets, rubber poncho, pillows, and quilts. A large stone jar may be placed in a packing box and insulated with torn paper or sawdust. The lid must be well padded and tightly hinged and hooked.

If no ice is available full use must be made of evaporation. *Farmers' Bulletin*, Number 927, Department of Agriculture, Washington, D. C., gives instructions for making an iceless

refrigerator, consisting of a backless cupboard standing in a tray with another tray on top which is kept filled with water. Strips of canton flannel or similar cloth are anchored by weights in the upper tray and extend into the lower tray. As the water seeps through the cloth surrounding the cupboard it evaporates and keeps the interior cool.

A milk bottle may be wrapped in a towel and stood in a basin of water and all covered with a large cloth or rubber apron.

In farm homes it is usually possible to place perishable food in a closed pail or bucket and suspend by a rope in the well, or even immersed in a watering tank in which there is running water.

Salad vegetables keep fresh if washed in cold water and placed in a tightly closed receptacle in a reasonably cool place. Eggs should be kept immersed in cold water.

References

Farmers' Bulletin, Number 927, U. S. Department of Agriculture, Washington, D. C.

JUSTIN and RUST: *Problems in Home Living*, J. B. Lippincott Company, 1929.

OLSON, LYLA M.: *Improvised Equipment in Home Care of the Sick*, 2d ed., W. B. Saunders Company, 1935.

CHAPTER XXXVII

ENTERTAINMENT AND OCCUPATION FOR CONVALESCENT AND CHRONIC INVALIDS

As mentioned in the chapter on "Special Problems in Nursing," employing the mind of the bedridden person becomes, in many situations, one of the major responsibilities of the home nurse and one which may tax her resourcefulness to the utmost. It may be difficult for the nurse or mother, whose time and thought are so fully taken up with other duties and activities, to realize how bored and depressed an individual becomes who has nothing to do but to look at three perfectly familiar walls—and think! The child, lacking the capacity for consecutive and integrated use of his mind, and having small store of associative memories, cannot even occupy himself with "thinking" for any length of time. The adult has too many memories from which, in his weakened condition, he is apt to select the gloomy ones, and he easily becomes depressed and morbid.

Constructive activity is essential to mental health at any age and under any circumstances. Keeping the mind and to any legitimate extent the hands of the occupant of the sick room busy becomes a matter of constant attention.

Care of Material.—Arranging a way of keeping the many things which accumulate is important. A screen with large and small pockets sewed, tied, or tacked in place, which may stand at the side of the bed, affords a receptable for a great deal of paraphernalia, gives the child something to do in putting things away, and saves the mother many steps (Fig. 123). A sort of cupboard may be made of small boxes placed in a larger open corrugated box with improvised drawer pulls or handles. A table with drawers and an extra shelf may be adequate.

Living Things.—It is wise to bring *life* into the sick room in every way possible and permissible. Flowers, plants, and fish decorate a room and are enjoyed by all ages. Chronic invalids

who are not disturbed by noise will enjoy singing birds. Pet animals, such as cats, small dogs, cages of white mice, rats, guinea pigs, etc., will give endless pleasure to children and to many adults.

Aquaria provide great possibilities for bedside amusement. There are fascinating varieties of goldfish, guppies, snails, and small turtles which may live in appropriate water gardens in small aquarium bowls placed by the side of the bed or in a window. Selecting and growing small water plants is in itself a fascinating occupation.

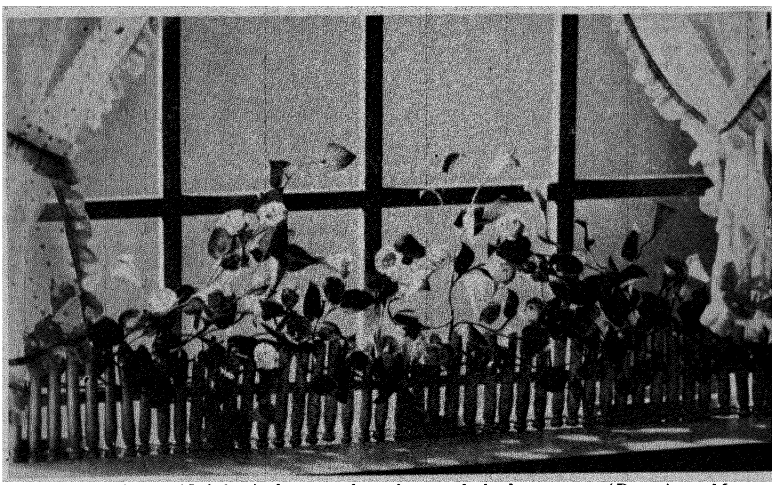


FIG 129.—An artificial window garden; fence of clothespins. (*Dennison Manufacturing Company*)

Flowers.—Watching the buds open in a flowering plant, or cultivating a miniature garden in a flat pan partly filled with sand or soil, provides continued employment and interest. A window-box garden may delight an adult who is shut in for a long time.[1] A window box may even be filled with paper flowers—an undertaking which will supply employment and provide color and cheer (Fig. 129).

Nature Study.—Watching cocoons open or looking at collections of eggs, butterflies, fossils, minerals, shells, etc., with the

[1] ROCKWELL, F. F., *Gardening Indoors*, The Macmillan Company, 1935.

ROCKWELL and GRAYSON, *Flower Arrangement*, The Macmillan Company, 1935.

reading of explanatory literature—these are especially good for children in the "collecting age" from eight to thirteen (Fig. 130).

Pets.—The care and companionship of a canary, or a cage of white mice or visits from pet dogs, cats, or kittens are helpful, especially if the child can read interesting things about pets and their care. In this connection animal stories may be read by the child or to him, and also books about the feeding and care and

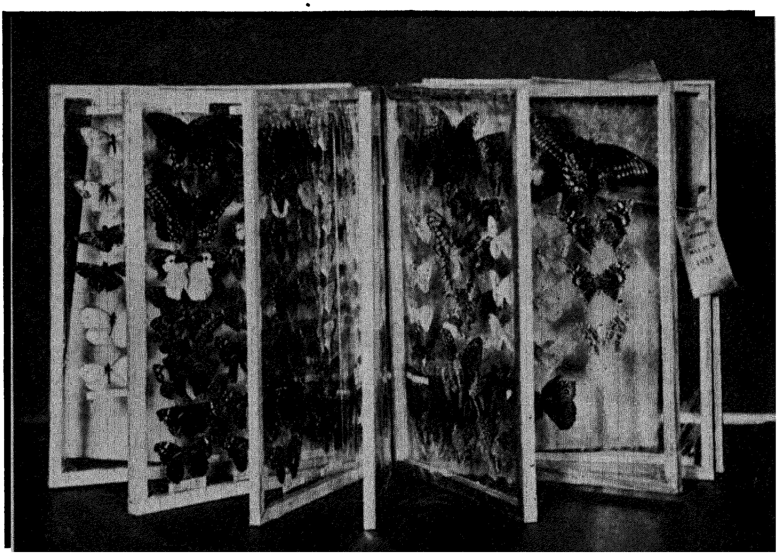


FIG. 130.—A collection of butterflies mounted between sheets of cellophane and assembled in a book. (*The Lawrence Hobby Fair*)

breeding of pets.[1] In some situations a shelf outside the window for feeding birds or squirrels, especially in winter, affords delightful breaks in the monotony of the day.

Growing Plants.—One may start small seeds on wet blotting paper, cotton, or a folded piece of burlap, or sprout vines in bottles of water, in pots of wet sand, or in a carrot, hollowed out and filled with water. A row of tumblers with different things growing in each may be suspended across the window by adhesive loops. A sweet potato placed in a glass jar filled with water will develop beautiful roots and runners. An artificial garden may be made by placing a large "clinker" from the furnace or a rubber sponge

[1] WHITNEY, LEON, *Pigeon City*, Robert M. McBride & Company, 1931.

in a bowl of water to which salt, mercurochrome, ink, bluing, vinegar, etc., are added from time to time. Very fascinating effects result.

Activities for Children.—Children of all ages share a fundamental instinct to create, to be doing something. Looking at static things or merely reading or hearing about the activity of others satisfies for limited periods of time only. To be happy they must be provided with things to do. Some dramatic projects are here suggested, as well as manipulative activities.

Miscellany.—Making scrapbooks of pictures, poems, jokes, recipes, classified information, collecting pictures of famous people, of historic costumes, etc., according to the age and interest of the patient, is a reliable form of employment. Carrying on postal-card correspondence is a popular project for shut-ins. A schoolchild enjoys writing to his schoolmates and receiving real letters by mail in return. A letter box made from a shoe box may be fastened to the bed post or bedside table, and the child's "mail" put in it while he is asleep. The child may make his own envelopes and decorate his letter paper with crayon, paint, or simple paper appliqué. (Fig. 131, 1). A postal-card "shower" may be managed, and the child may mount the cards in an album as a souvenir. Even adults greatly enjoy such a breath from the outside.

A bunch of small balloons may be inflated and anchored to the bed or to the wrist and kept moving with a fan. A kite may be made and tied to the bed, and kept in motion with a fan in the hand or an electric fan. Making face masks from paper bags is diverting.

A "real boy" may work off surplus energy by using a bean-shooter on toy animals placed at suitable distances about the room. He may even make a real bow and arrow (small) and use it on a target fastened to the foot of his bed.

Blowing soap bubbles can be managed by spreading a woolen blanket over the bed with only the child's arms outside. Adding glycerine, bluing, or dyes to the suds produces beautiful effects, and the bubbles bounce about on the wool surface without breaking.

A shallow pan of water on which to sail peanut-shell boats appeals to any child. Tiny sails may be made of toothpicks or

pins and tissue paper; tiny plasticine figures may be added. A rock island may be put in the center of the pan, and the boats may be propelled by an electric fan, by fanning with the hand, or by blowing. Celluloid fish, turtles, etc., may be floated on a pan of water in the same manner.

Dramatization.—Read "The Land of Counterpane" by Robert Louis Stevenson.[1] After listening to this, any lively child will have a period of active, dramatic make-believe with various

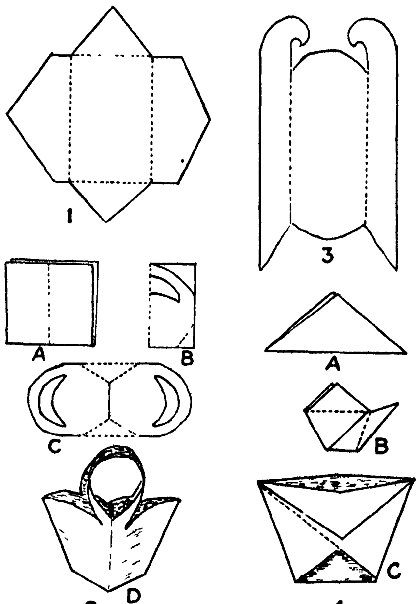


FIG. 131.—Things to cut from paper: 1. an envelope; 2. a basket; 3. a sled; 4. a drinking cup. (1. 2. 3—*modified from Book of Dennison Crafts.*)

playthings, utilizing his bed for a stage. If he is old enough he will enjoy memorizing the poem. Also read, if possible, *Floor Games* by H. G. Wells.[2] In these floor games, which H. G. Wells devised with his own children, large pegboards were used. Small branches and twigs stuck in the peg holes made trees and shrubbery. Piles of wet sand or dirt were landscaped into fields, hills, mountains, etc. Pieces of mirror made lakes and ponds. Tooth-

[1] From *A Child's Garden of Verses.*
[2] *Floor Games,* McClure Publishing Company, 1914.

picks made picket fences or rail fences. Farms and towns were laid out; houses made from small boxes. Telephone wires were stretched with thread from posts stuck in the peg holes. Small celluloid animals, small dolls, images, and implements of all sorts provided dramatic materials. When the child wearies of playing with this, the board may be put away without disturbing the setting, and the dramatization continued at another time. The Wells children had a number of peg boards and carried on

FIG. 132.—The old woman who lived in a shoe (peg board and bottle dolls).

projects, sometimes, for days at a time. Larger dramatic projects may be developed by children who are confined to bed or room for some time (Figs. 139 and 140).

A bottle doll may be made by tying a bit of white cloth padded with cotton over the neck of any sort or size of bottle. On this a face is drawn or painted, and raveling or thread or wool hair sewed on. The body is then dressed with crepe paper fastened with glue. Paper arms and hands may be added.[1]

[1] FORBUSH, BRYON, *Manual of Play*, American Institute of Child Life, 1914.

These dolls have the great advantages of standing up and of costing practically nothing. Any Mother Goose story or fairy tale may be dramatized with bottle dolls in an appropriate peg board setting supplemented by toys and other stage properties. Mother Goose tales may be set up, such as *The Old Woman Who Lived in a Shoe* (Fig. 132), using a shoe or a slipper with an awning over it as the central property; or *Humpty Dumpty*, using a peg board with a wall of small blocks or dominoes and making Humpty

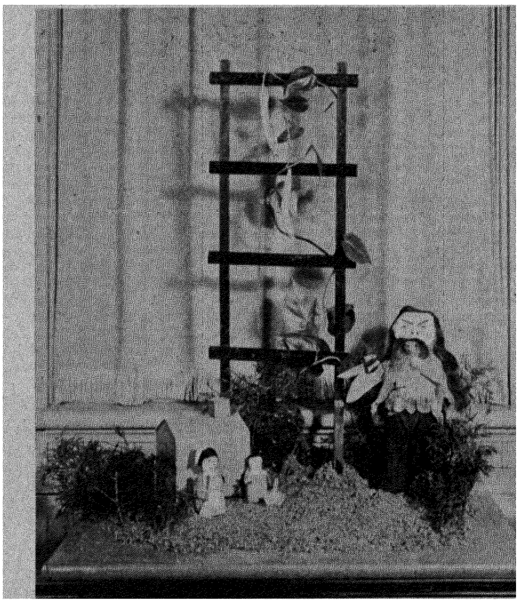


FIG. 133.—Jack and the beanstalk (peg board and bottle dolls).

Dumpty with a bendable wire body and an eggshell head; or fairy tales such as *The Three Bears*, *Cinderella*, with her pumpkin coach, *Little Red Ridinghood*, the *Three Little Pigs*, with the "big bad wolf," or *Jack and the Beanstalk* (Fig. 133).

Cardboard boxes or orange crates make wonderful doll houses, which may be furnished with the cooperation and assistance of an adult. Four boxes of the same size afford the doll family a kitchen, living room, dining room, and bedroom (Fig. 134). The boxes may be fastened to a board and to each other by nails, clips, or glue, according to size and material. The entire unit

may stand on a chair or table at the bedside and be removed when the child is through playing with it. The child may like to have this and other favorite possessions placed within range of vision. She may have bright ideas for furnishings while merely looking at it from across the room.

Many, if not most, small boys enjoy playing with dolls and carrying out domestic make-believe, but boys and girls alike enjoy setting up a circus or menagerie, or dramatizing Noah's ark, or a county fair.

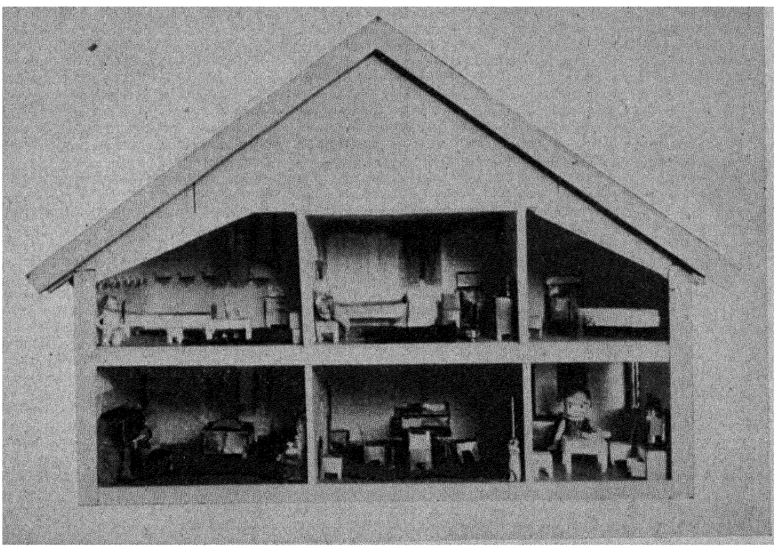


FIG. 134.—A charming small playhouse (*Fargo Public Schools.*)

Puppets (hollow cloth figures with padded heads, which are slipped over the hand and thus manipulated) are easily made and enjoyed by children of any age, with or without stage setting (Figs. 135, 136). Punch and Judy shows are immemorial classics. Whether they are presented to the child ready-made or whether he shares in the making, they are a perpetual joy.[1]

[1] ROSE, A., *The Boy Showman*, E. P. Dutton & Co., Inc.,

PERRY, EVADNA KRAUS, *Art Adventures with Discarded Materials*, Wetzel Publishing Company, Inc., Los Angeles, 1933.

School Arts Magazine, Worcester, Mass., December, 1927.

Marionettes (jointed figures manipulated by threads attached to the various parts) are endlessly entertaining to the young child, while older children may actually make simple sets.[1]

A moving-picture theatre can be easily made within a box and provides for endless changes of scene. Pictures are drawn or pasted upon a long strip of paper which is rolled upon a double windlass in such a way that the successive views appear before a square opening in the box (Fig. 137).

FIG. 135.—A hand puppet. (*Dennison Manufacturing Company.*)

Colored cutouts may be found in old magazines which may be pasted on a sheet of cardboard to form landscapes or pictures. Dolls with jointed bodies and with accompanying wardrobes may be found in magazines, and when the dolls are pasted on cardboard and cut out they may be costumed in many ways and utilized in the dramatic settings previously described or as special decorations for the child's room. Very delightful books of paper dolls and furniture, etc., to be colored and cut out may be purchased in the dime stores. Simply cutting paper dolls and animals is great fun (Fig. 138).

Making animals, flowers, etc., out of vegetables, dried fruits, or gumdrops, may provide endless dramatic materials and is an absorbing occupation (Fig. 139).

Mechanics.—Tinker toys (very simple for the small child and really scientifically complicated for older children) are educative and entertaining. A board, box lid, or tray should be used as a foundation and the structure preserved if the child desires. Taking an old clock or watch or any piece of mechanism apart

[1] *School Crafts and Projects*, Book 3, Puppets, p. 45, and Hat Box Theatre for Paper Dolls and Simple Marionettes, p. 46, Dennison Mfg. Co , Framingham, Mass.

FIG. 136.—Hand puppets in action on a stage. (*The Children's Bureau, Kansas City, Mo.*)

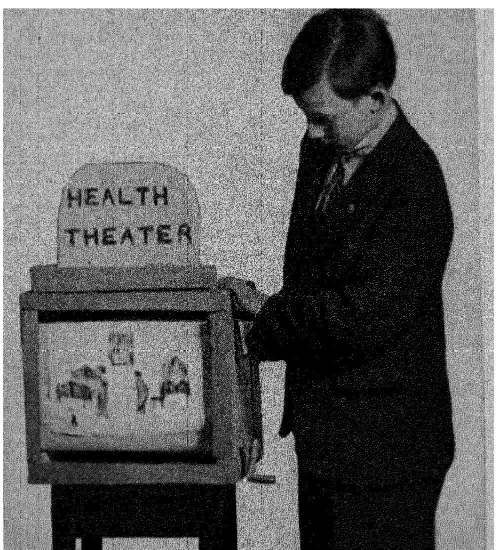


FIG. 137.—The moving-picture theatre has endless possibilities for the crippled or shut-in child, especially if he can invite in his friends to "shows." (*Fargo Public Schools.*)

and reassembling it or making new things out of the pieces is ever fascinating.

Sets of small blocks of various sorts, with a tray or lapboard upon which to build, will employ periods of time for the small child. Spools may be strung upon a shoestring (Fig. 140); large or small beads or buttons strung with needle and thread. The smaller child may place pegs in a pegboard, manipulate nests of boxes or painted vegetable cans, or arrange dominoes or checkers.

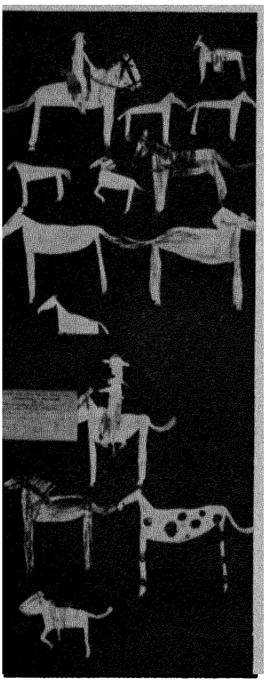


FIG. 138 Paper cut-outs by a first grader whose interest was horses! (*The Lawrence Hobby Fair*)

Weaving and Related Activities.—Weaving with twisted tissue paper, corn husks, raffia, or cellophane has many possibilities[1] (Fig. 141). Belts, baskets, handbags, lamp shades, etc., may be made. Folding paper to make cups, boats, hats, paper dolls, doilies, and decorations never loses its charm (Figs. 131 and 142). Knotting twine with a homemade wooden shuttle to form a doll hammock or goldfish seine may be tried.

Weaving doll rugs or handbags on cigar-box looms with yarn or strips of cloth is fascinating and not difficult (Fig. 143). Spool knitting has been known to children for ages. Making pompons from yarn is simple and may provide adornment for doll garments, tiebacks for curtains, etc. For older children Indian beadwork may be tried as described in most scout books.

Sewing.—Making doll clothes, curtains, bedding, quilts, etc., for the doll house or doll bassinet will intrigue the child who can manipulate a needle, and a child three years old or younger will enjoy a needle and thread and scraps. Give it a big needle and tie in the thread! Braiding strips for small rag rugs, crocheting a cap, a rug, a doll, or lace for doll curtains may be tried.

Soap.—Pushing toothpicks or small nails into cakes of soap is an old scheme of employment for the very young child. Soap

[1] *School Arts Magazine*, p. 430, March, 1928.

carving may be attempted at any age, using a variety of knives, scissors, and instruments. A cake of soap cut into two thin slabs affords a good medium for line drawing or bas relief work. The indentations can even be colored with dry dyes or paints.

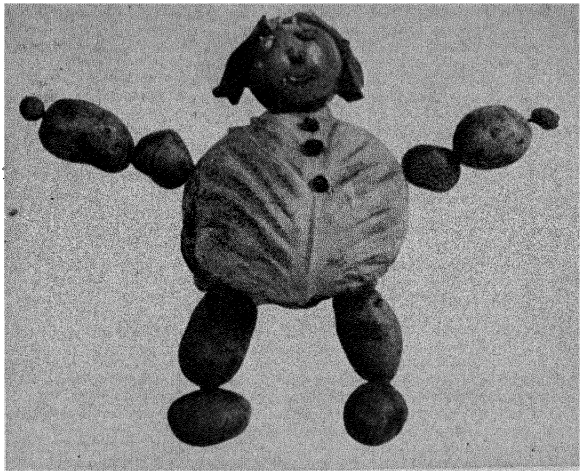


FIG. 139.—Vegetable animals are great fun. (*Fargo Public Schools.*)

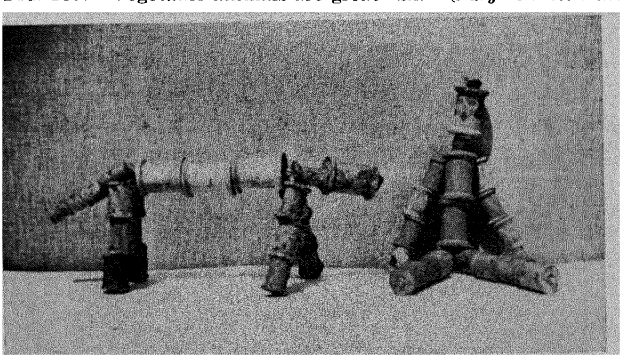


FIG 140.—Spools may be strung.

Cizzorettes furnish much opportunity for the exercise of imagination and may be very simple for the young child or elaborate for the older child. Cizzorettes are geometrical figures cut from dark paper. The game is to see how many designs can be made from one set of unit pieces (Fig. 144).

Clay.—Manipulating or modeling with plasticine or modeling clay has endless possibilities for any age. Lacking plasticine, bread dough, a pan of sand wet in warm water, or a lump of

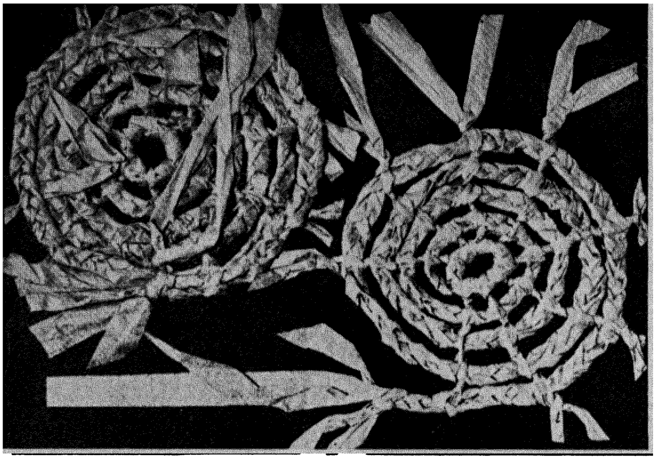


FIG. 141.—Weaving with paper. Made by pupils of Frank M. Rich, Paterson, N. J. (*School Arts Magazine, March* 1928.)

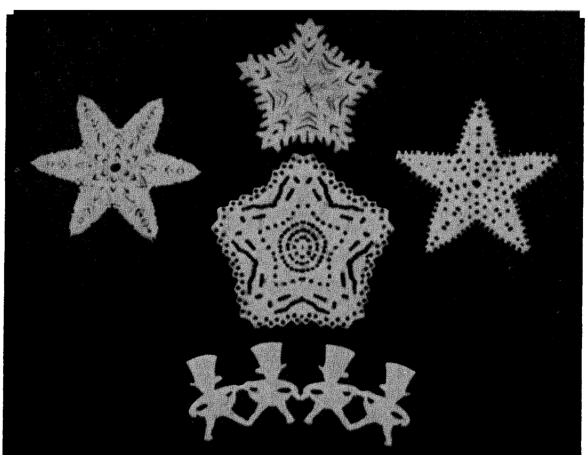


FIG. 142.—Paper novelties made with scissors, punch and tearing.

fresh putty may supply a plastic medium (Figs. 145 and 146). A discarded inner tube provides material for almost enless play of imagination and fingers (Fig. 147).

Drawing and painting may be pursued in bed with proper management. An easel can be improvised from a corrugated paper box having no ends, the sides of which are fastened together to form a triangle (see Fig. 128). Paper can be fastened to the sloping side of this with thumbtacks. If water-color paints or finger paints are used a rubber apron, adult size, may be fastened around the neck of the child and spread over the bed

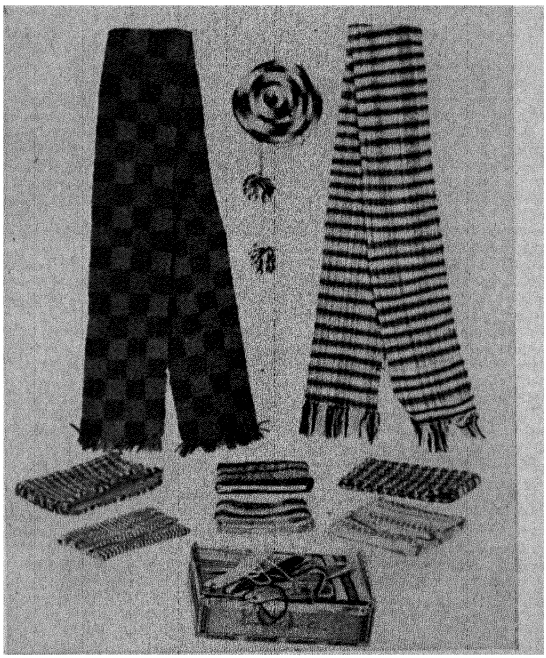


FIG. 143.—A loom made from a cigar box with some of the things which may be made from it. (*Scarfs and handbags from the Lawrence Public Schools.*)

under the easel. The paint cups may be assembled in a box lid. Finger painting is particularly adapted to the young child, but must be done on wet paper tacked to a flat surface such as a drawing board or breadboard.[1]

Some children may enjoy making a frieze for the room from cutout pictures, or, better still, from pictures made and colored and cut out by the child himself. A background may be made

[1] SHAW, RUTH FAISON, *Finger Painting*, Little, Brown & Company, 1934.

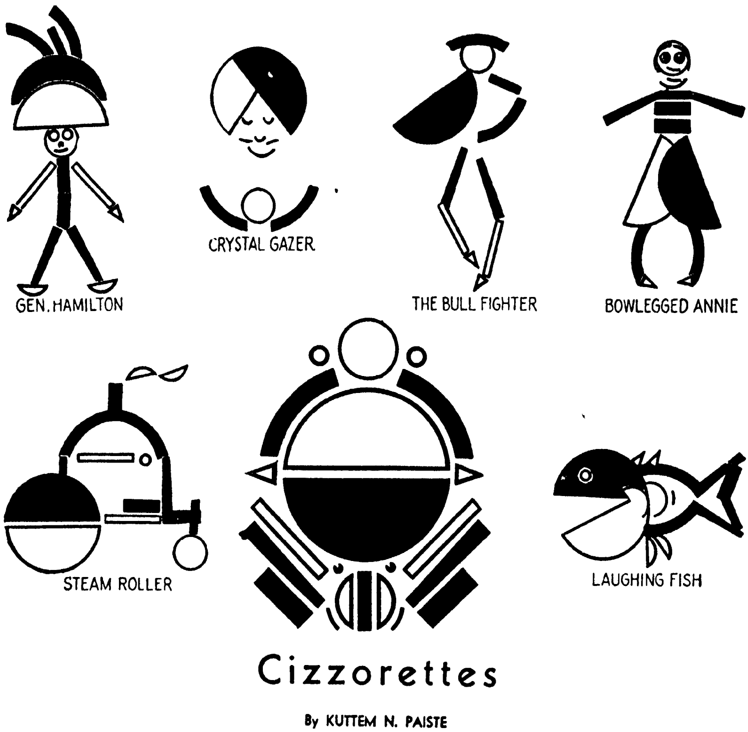


FIG. 144.—See how many things you can make from these pieces. (*Children's Activities, March*, 1935.)

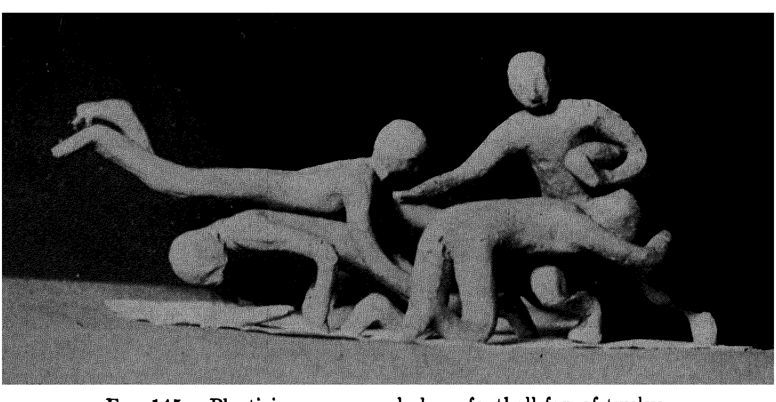


FIG. 145.—Plasticine group made by a football fan of twelve.

from a 6-inch strip of green paper with a strip of blue or gray-blue paper above it for the sky. This is tacked about the wall at an easy height for the child's eyes and the figures pasted on as he

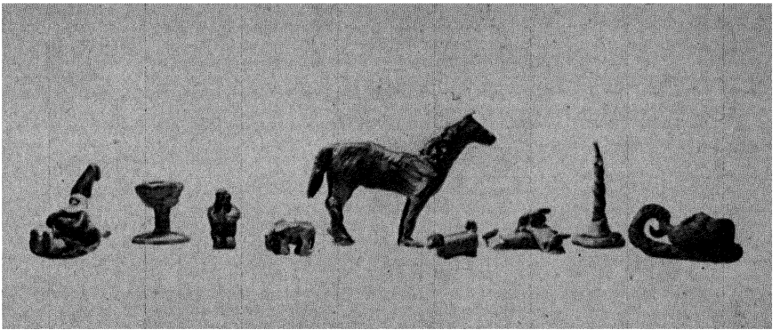


FIG. 146.—Plasticine modeling by children seven to nine years of age. (*Lawrence Public Schools.*)

completes them. A jolly frieze would be the story of the flood. The ark with Noah and his family will be the central feature. From this, on either side, may stretch an endless procession of animals, two by two, going toward the ark. An occasional tree

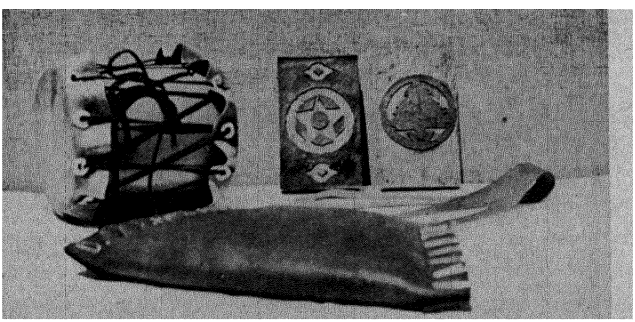


FIG. 147.—Novelties made from an inner tube. Stretched over a coffee can it makes a first-class drum; pasted on wood it makes easily cut block prints, a section clamped with paper clips holds water or ice; a double loop will silence a rattling door when looped over the knobs, or the loops will stretch over books or a package for convenient carrying.

or other landscapė detail may add to the artistic effect. The composing of the frieze may continue over a period of days, only one or two things being made at a time.

A clever little toy can be made from paper and apple seeds. Two circular pieces are cut, using a tumbler or any round dish as a pattern, one from cardboard, the other somewhat larger from thin but firm colored paper. On the cardboard disc sew apple seeds with black thread, adding to each two stitches for whiskers and leaving a loose bit of thread for a tail. The other piece is folded and slashed. When opened, a thread is attached to the center (anchor to a small button inside to prevent tearing) for hanging, and the paper is pasted to the cardboard disc. A beehive-shaped cage, with little brown mice inside, is the result.

Stories and Games.—One mother filled a gap by giving her child a jewelry box containing odds and ends of ancient family jewelry.

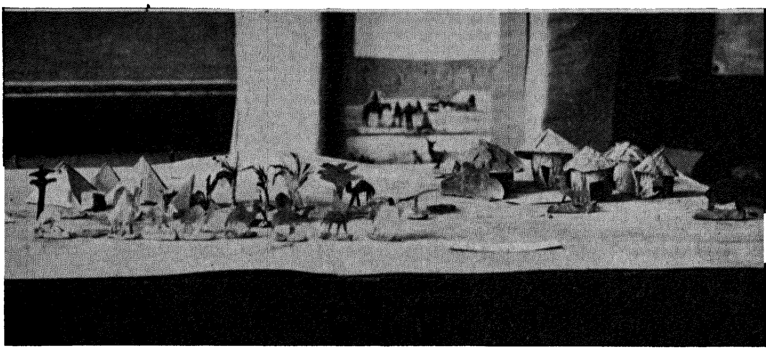


FIG. 148.—A trip to Africa via paper and plasticine. (*Wichita Public Schools, fifth grade.*)

Examining the contents and listening to stories about the different items gave the child a memorable experience. Looking at old photographs or snapshots provides a similar opportunity for learning some family history and at the same time disposing pleasantly of a long afternoon.

Another mother filled a basin with a variety of small, interesting articles. A paper piecrust covered all. Once each hour "Little Jack Horner" stuck in his thumb and pulled out a "surprise."

Making shadow pictures on a wall or screen will interest a child for some time. Illustrations for such shadowgraphs will be found in many books[1] (Fig. 150). The child and his nurse may play simple guessing games. For example: "I have a bright idea."

[1] ROSE, *op. cit.*, pp. 176–191.

"What is it like?" "Like you." "Why?" "Because it has curly hair." Answer: "The poodle dog." Or: "I see something that rhymes with hat." Answer: "The cat." Or: "Guess where (in my mind) I have hidden the shears." The mother can sit with her sewing and carry on such games indefinitely.

Older Children and Adults.—For the older child and the adult the quality of usefulness should attach to at least some of the activities. The nurse and the family should try to make any invalid feel not only that he is a minimum of trouble but that he is

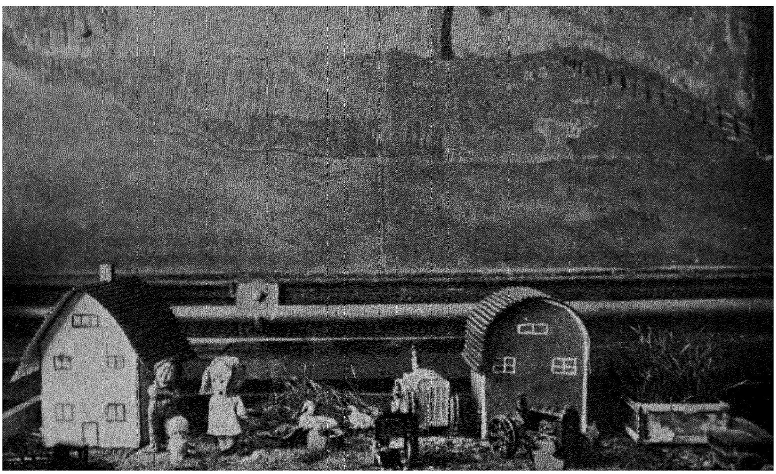


FIG. 149 —Who would not be a farmer! (*Wichita Public Schools.*)

actually helpful. This is particularly important in the case of the aged and permanently disabled. No normal person enjoys being a helpless object of care. Also no one quite loses his grasp on life as long as he feels necessary and useful in his group.

What any individual can do depends upon many factors: the nature of his disability, his previous interests and training, his native resourcefulness, etc.[1] The following suggestions may be found helpful as hints for useful and even remunerative employment.[2]

[1] TRACY, SUSAN, *Invalid Occupation*, Whitcomb and Barrows, 1910.

[2] WILSON, ELITA, *How to Make Money at Home*, The Macmillan Company, 1931.

Household Assistance.—The invalid may keep household or business accounts. She may do any small handwork jobs which arise about a household, such as shelling peas, cracking nuts, marking linen, doing the family mending. The members of the family should not feel that they are imposing upon the shut-in by asking for such favors and assistance (within reason and with due consideration of the invalid's condition). Feeling useful adds much to contentment.

Needle and Textile Work.—Many things may be done in the line of needlework: hand sewing, or embroidery,[1] or patchwork;

FIG. 150.—Shadow pictures. (*Rose, The Boy Showman, E. P. Dutton Co., Inc.*)

crocheting, braiding, or hooking rugs;[2] knitting anything and everything salable, bags, infants' wear, jackets, sweaters, dresses, hats, etc.;[3] mending linen or lace; hand weaving with yarns for table mats, handbags, or cushion tops (Fig. 143);[4] piecing quilt tops or tops for cushions, or wall pieces;[5] appliqué; designing and making hats, neckwear, belts, handbags, etc.

[1] MELWON, EVA R., *The First Book of Embroidery Design*, The Macmillan Company, 1932.

[2] HICKS, AMY MALI, *The Craft of Handmade Rugs*, McBride, Nast and Co., 1914.

PHILLIPS, ANNA M. LAISE, *Hooked Rugs and How to Make Them*, The Macmillan Company, 1930.

[3] MIDDLETON, EDITH K., *The New Knitting*, The Macmillan Company, 1931.

[4] PERRY, *op. cit.*

[5] WEBSTER, MARIE D., *Quilts, Their Story and How to Make Them*, Doubleday, Page & Company, 1916.

One businessman, a baker, having to undergo a period of semi-invalidism, turned to needlework while his wife ran the business. He found it immensely diverting. He decorated curtains for the house, did the family sewing, and ended, triumphantly, by doing exquisitely the needlework on his daughter's trousseau.

Handcraft has many possibilities such as whittling, wood-carving, jig-saw carving; tooling leather, making jewelry, metal-work in brass, copper, and silver; Indian beadwork; jewelry from

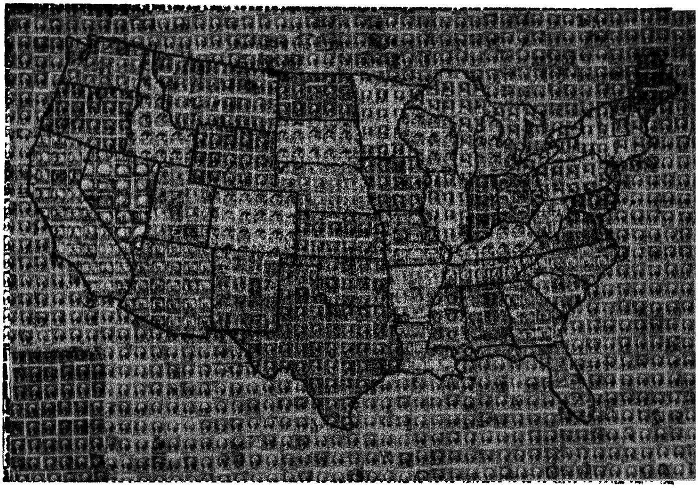


FIG. 151.—Stamp map. The states are made from different colored stamps, the background in three-cent stamps. The effect is very colorful. (*The Lawrence Hobby Fair.*)

sealing wax; crepe-paper novelties.[1] The patient may decorate place cards or nut cups; tint and mount photographs; make portrait silhouettes; design posters; letter signs; letter and decorate programs. He may design and cut linoleum or wood blocks, or blocks from inner tubing glued on board,[2] or stencils. He may even breed, care for, and sell birds, white mice, snails, guppies, fish, turtles, etc.

[1] PICKEN and LANGWIN, *School Crafts and Projects*, Dennison Mfg. Co., Framingham, Mass., 1932.

[2] HAMILTON, EDWIN T., *Handcraft for Girls*, Chap. V, "Lino-block Printing," Harcourt, Brace & Company, 1932.

Children's Activities, p. 44, Child Training Association, Chicago, March, 1935.

Clerical Work.—The shut-in may do a variety of clerical work for pay, such as typing manuscripts, addressing envelopes, making out monthly statements, designing and writing advertisements, writing editorials, etc.

Activities for older children and adults which may be entertaining or educative though not remunerative include games of many kinds which may be played alone or with two players such as: solitaire, Russian bank, cribbage, checkers, dominoes, chess, flinch, anagrams, jackstraws, crossword puzzles, ma jong; trying to

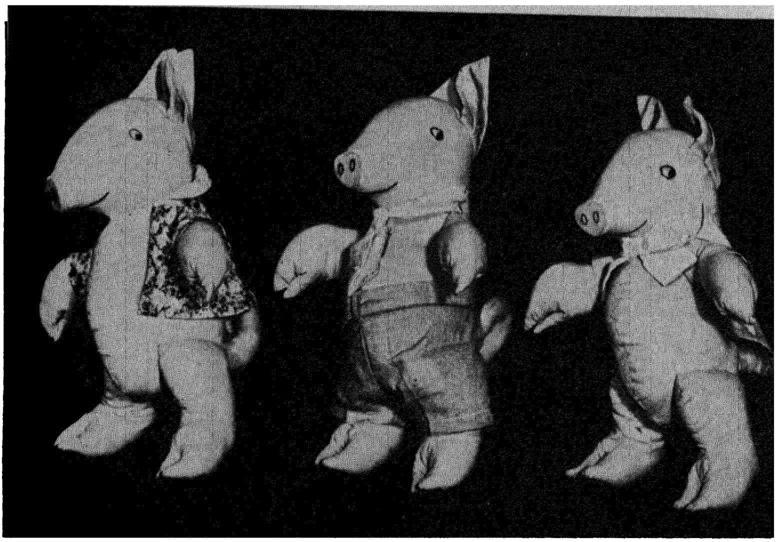


FIG. 152.—Making cloth animals. The three little pigs.

invent new games of solitaire; solving and inventing crossword puzzles; learning to do card tricks or sleight of hand.

The shut-in may try collecting and guessing conundrums; believe-it-or-not facts; writing acrostics, limericks, and jingles. He may collect, classify, and read about minerals, fossils, stamps, coins, or other curios or small objects of art. He could collect or make architectural designs, as of doorways or cornices or make house plans for repair or remodeling or for a new house or garden. He may try sketching or drawing, making stamp maps (see Fig. 151), or making a weather map.

The invalid may learn flag signals, the flags of the nations (from the back of the dictionary), bugle calls; play musical instru-

ments such as the accordion, mouth organ, flute, cornet, banjo, or dulcimer; learn bird songs and how to imitate them. He may study the art of conversation; correct speech and voice modulation, with the help of some treatise on the principles of speech;

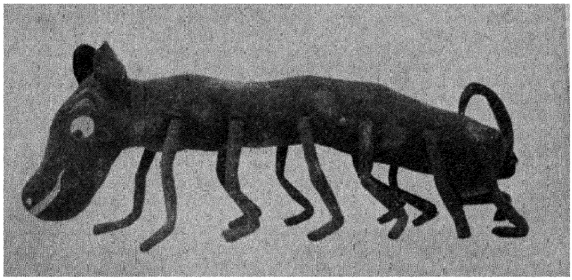


FIG. 153. The "Snollygoster" (made from an old stocking), with apologies to *Tuckie and Cuddles*. (*Mrs. Winthrop Williams in Kansas City Star.*)

how to read aloud effectively; singing; a foreign language. He may listen selectively to radio programs or to victrola records chosen to teach music appreciation. He could try writing and telling stories. Writing or dictating one's own autobiography is

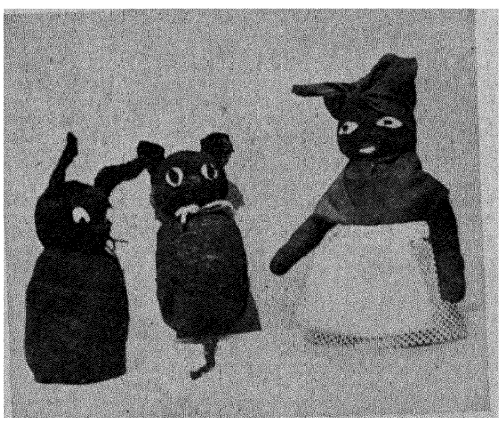


FIG. 154.—All from a pair of black socks and a couple of milk bottles.

essentially adapted to an older person and may be interesting for the entire family.

There are many things the patient may make: toys with jig saw, knife, nails, paint, etc.; cloth dolls and animals (see Figs.

152; 153; 154); books or card collections of cooking recipes; travel books, written or pasted. She may dress character dolls (see Fig. 155); collect cartoons and look up the artists; collect

FIG. 155.—One may dress character dolls. (*Spooner-Thayer Museum, University of Kansas.*)

and classify jokes; collect "boners." A boy with a knife may make interesting things from roots (Fig. 156), or walnut buttons, toy baskets, etc.

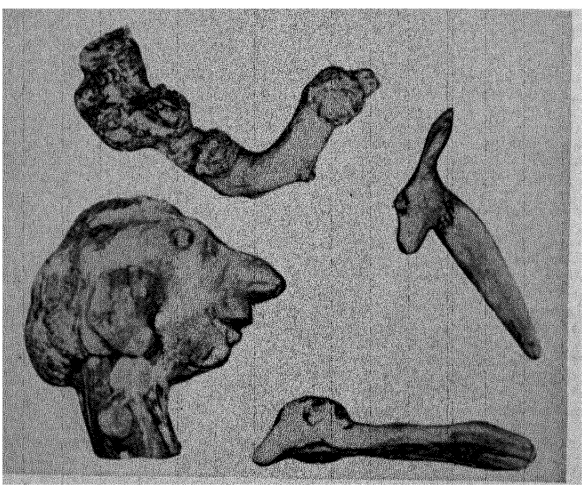


FIG. 156.—Queer roots with a little bit of sculpturing become interesting.

Looking in a kaleidoscope or stereoscope will furnish a striking change of occupation when one is bored by monotony.

Reading, listening to reading or to music, or looking at pictures, all are valuable, but a child or nervous adult may weary after a very short period of sustained attention.

Making and collecting skeleton autographs is great fun. To do this fold a piece of paper, then write the name heavily in ink along the crease. Fold and press while wet. The result is a characteristic, skeletonlike figure which is very funny. One may

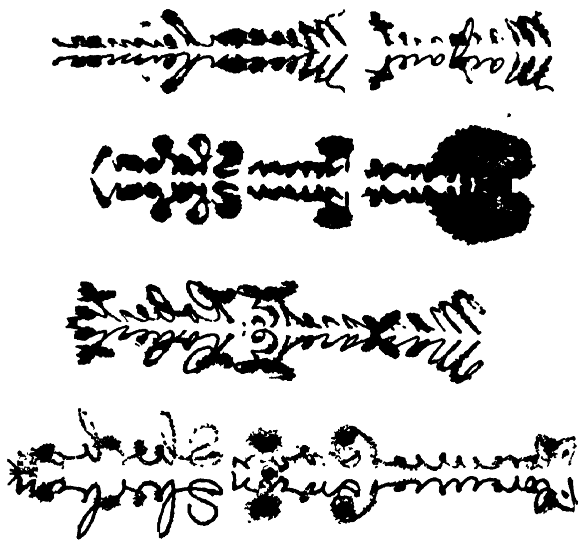


FIG. 157.—Skeleton autographs.

collect these from visiting friends and paste them in a souvenir album (see Fig. 157).

References

BEARD and BEARD: *Little Folk's Handy Book*, Charles Scribner's Sons, 1912.

BEARD, D. C.: *The American Boy's Handy Book*, Charles Scribner's Sons, 1912.

———: *The American Girl's Handy Book*, Charles Scribner's Sons, 1912.

BEVANS, GLADYS HUNTINGTON: *Caring for and Amusing the Convalescent Child.*

Children's Activities, Child Training Association, Chicago.

Dennison-Craft Instruction Books, Dennison Mfg. Co., Framingham, Mass.

DIETZ, LENA DIXON: "Amusing Quarantined Children," *Hygeia*, November, 1934.

DOUGLASS, MARGARETTA: *Health and Home Nursing*, G. P. Putnam's Sons, 1932.

FAEGRE, MARION L.: "When Your Child Must Stay in Bed," *Ladies' Home Journal*, May, 1935.

FISHER, DOROTHY CANFIELD: "The Rainy Day," *Delineator*, March, 1935.

FORBUSH, BYRON: *Manual of Play*, American Institute of Child Life, 1914.

HAMILTON, EDWIN T.: *Handcraft for Girls*, Chap. V, "Lino-block Printing," Harcourt, Brace & Company, 1932.

HARRISON, EVELEEN: *Textbook of Home Nursing*, The Macmillan Company, 1929.

HICKS, AMY MALI: *The Craft of Handmade Rugs*, McBride, Nast and Company, 1914.

Junior Home, Child Training Association, Chicago.

LOSH, ROSAMOND: "Puppets Teach Health and Safety," *Childhood Education*, March, 1933.

MELWON, EVA R.: *The First Book of Embroidery Design*, The Macmillan Company, 1932.

MIDDLETON, EDITH K.: *The New Knitting*, The Macmillan Company, 1931.

Parent's Magazine: New York.

PERRY, EVADNA KRAUS: *Art Adventures with Discarded Materials*, Wetzel Publishing Company, Inc., Los Angeles, 1933.

PHILLIPS, ANNA M. LAISE: *Hooked Rugs and How to Make Them*, The Macmillan Company, 1930.

ROCKWELL, F. F.: *Gardening Indoors*, The Macmillan Company, 1935.

ROCKWELL and GRAYSON: *Flower Arrangement*, The Macmillan Company, 1935.

ROSE, A.: *The Boy Showman*, E. P. Dutton & Co., Inc.

SAGE and COOLEY: *Occupation for Little Fingers*, Charles Scribner's Sons, 1913.

School Arts Magazine, Worcester, Mass.

SHAW, RUTH FAISON: *Finger Painting*, Little, Brown & Company, 1934.

SNOW and FROLICH: *A Hundred Things a Girl Can Make*, J. B. Lippincott Company.

STARR, LAURA B.: *The Doll Book*, Outing Publishing Company, 1908.

STEVENSON, ROBERT LOUIS: *A Child's Garden of Verses*.

TERRY, EDITH M.: "Helps for Children Who Must Not Be Active," Child Health Bulletin, July, 1935.

TRACY, SUSAN: *Invalid Occupation*, Whitcomb and Barrows, 1910.

TROTH, GERTRUDE M.: "The Spoiled Child Sick-a-bed," *The Trained Nurse and Hospital Review*, September, 1922.

WEBSTER, MARIE D.: *Quilts, Their Story and How to Make Them*, Doubleday, Page & Company, 1916.

WELLS, H. G.: *Floor Games*, McClure Publishing Company, 1914.

WHITNEY, LEON: *Pigeon City*, Robert M. McBride & Company, 1931.

WILSON, ELITA: *How to Make Money at Home*, The Macmillan Company, 1931.

UNIT IV

SAFETY FIRST AND WHAT TO DO IN EMERGENCIES

CHAPTER XXXVIII

SAFETY

Recently, the whole nation was shocked by the great catastrophe of the burning of the Morro Castle with its attendant loss of over 100 lives. Public sentiment was aroused and emotions stirred to the depths by the spectacle of such a collective loss. Yet during the year 1933 alone 5,700 persons were burned to death in American homes with little or no notice taken of this tragedy. More than one-third of this number were children under five years of age. In a collective group, this loss would have shocked the civilized world. The very nature of the average home accident is such that we do not realize the enormity of the loss. In fact, the individual cases of those who burn to death in homes are so widely distributed as to pass almost unnoticed.

Some realization of the total consequences of home accidents can be gained from the following facts. The number of deaths from home accidents in 1933 was twice as great as those occurring in all the industries combined. The risk from home injuries is almost seven times as great as that on buses, taxicabs, boats, airplanes, trains, and other public conveyances, according to the findings of a large life insurance company, which recently made an extensive study of accidents. The menaces that cause accidental deaths in the home are far greater than those of the deadly contagious diseases—diphtheria, scarlet fever, pneumonia, tuberculosis, etc. That a father is more than twice as safe in the factory or on the street as he is in his own home, and that Johnny is seven times as safe in the school building as he is under the parental roof, is somewhat of a shock.[1]

Relative Frequency of Various Accidents.[2]—In 1930 nearly 99,000 persons were killed by accidents, 1 person every 5⅓ minutes, a third more than in 1921. About 10,000,000 persons were injured by accidents, 1 person every 3⅙ seconds, 1 person out of every 12 in the country. About 18,000 children under fifteen years of age were killed by accidents. These accidents cost a total of approximately $3,000,000,000, or $95 every second.

[1] LOSH, ROSAMOND, "The Child's Greatest Hazard," *The Trained Nurse and Hospital Review*, April, 1935.

[2] *Will the Rising Toll of Accidents Hit You?*, Bulletin of the Metropolitan Life Insurance Company, 1931.

The causes of the 99,000 fatalities were distributed as follows: 33,000 killed in motor vehicle accidents, 30,000 killed by accidents in the home through falls, burns, suffocation, fires, and poisons, with frequency in order of mention. The next largest number of deaths from accident is 20,000 fatal accidents occurring in public places, and the next is approximately 16,000 fatalities among industrial workers.

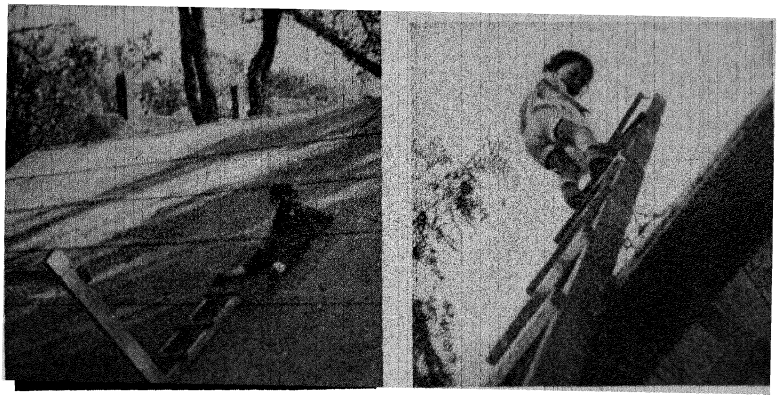
Safety in the Home.—It is far better to prevent accidents and emergencies than it is to know what to do when they occur. It is urgent that the home be made safe when, next to automobile accidents, the largest number of accidents and fatalities occur in the home. The presence in the home of the very young and the very old helps to account for this.

Every child should be brought up to take care of himself and to look out for the safety of others to the full extent of his capacity for responsibility at any given age. This training should begin the first time the creeping child at ten months goes part way up the stairs. He should be encouraged to come down the steps he has ascended and should be helped as little as possible (see Fig. 21). When the child falls down he should be encouraged to get up without assistance. When he later is found on top of the garage roof the escapade should be treated casually as an interesting adventure, the most thrilling part of which is negotiating a safe descent of the ladder which he ascended so blithely (Fig. 158). Children should be conditioned to caution and self-reliance rather than to fear in relation to all the usual activities and situations of life, such as climbing, use of fire, water, electricity, etc.

The very young child who has never been made afraid of water learns very easily to swim, and should be taught to swim at the earliest opportunity. The person who feels at home in the water and can take care of himself is the one who is safe (Fig. 159). If there is a lily pool or fish pond it should be enclosed or covered with wire netting until the very small child has become familiar with it and acquires caution.

Children should be made familiar with the proper use of heating and electrical equipment with their earliest curiosity concerning such equipment. This is safer than repressing natural curiosity and trying to condition by fear.

The next point in safety education is training the young child in certain automatic responses which may be useful in emergencies.



A B

FIG. 158.—*A*, David (32 months) was found on the ridgepole of the garage, he came all the way down safely by himself. *B*, Virginia (18 months) was discovered at the top of a 16-ft. ladder; she came down safely. The safe descent was the most thrilling part of these adventures.

FIG. 159.—The child should be at home in the water.

Among the first precautions is teaching him, as soon as he can form sentences, to repeat his name, his father's name, and his

address. If the house is not numbered, some descriptive phrase may be taught, such as "the little brown house by the Linwood Church," or "the second house north of Lincoln School." One mother played her three-year-old daughter was lost.[1] She would pretend to be a stranger and would say, "Little girl, are you lost? What is your name? What is your daddy's name? Where do you live? Shall we try to find your home?" They would take a walk around the house or the block, and chance, most surprisingly, upon her home! A game may be made of "finding our house" when coming home from a trip downtown, gradually increasing the distance at which the game begins.

One of the next things to be taught is the use of the telephone. When the runabout becomes very curious and imitative about the telephone he should be permitted to talk to his daddy over the phone. As soon as he can speak clearly he should be taught to call his father correctly and should be permitted to do this often enough to develop skill and certainty. As soon as he is old enough to understand something as to the nature of police and fire protection he should be taught how to call these departments.

In every home the parents should have *one emergency word*, such as "stop" or "listen," which is used *only* when instant obedience is necessary to safety. This word, whatever it is, should never be used on usual or ordinary occasions.

A first-aid equipment should be kept in every house (see page 280). Every member of the family should know where it is and what use to make of each item. A series of here-and-now stories of accidents may be staged with appropriate make-believe rescue. The rudiments of first aid in emergencies requiring instant action may thus be taught in graphic and dramatic play. Through carrying out this educational work with young children the adults of the family will keep themselves trained and up-to-date. The spirit of the dramatization must be casual, and fright or overemphasis should be carefully avoided.

Automatic response is necessary in fire, hemorrhage, and electric shock. Calling the fire department, putting out various sorts of fire, rescuing people, saving belongings, and first treatment of burns, all should be discussed and rehearsed, but children should never be made "accident-conscious" or nervously apprehensive.

[1] *Parents' Magazine*, March, 1935.

The children may make a tour of inspection of the house looking for fire hazards and watch each other for careless conduct. One family assessed themselves fines for carelessness. The fines thus acquired might go toward the purchase of a fire extinguisher.

Every child should know what to do in case fire breaks out in the basement (keep doors to basement closed); if fire breaks out in the attic or upstairs (close off if possible); if it breaks out in the kitchen from a loose burner on the gas stove (use fire extinguisher, flour, smother out with tea towels, blankets, etc.). *Do not use water with oil or gasoline fire as this will spread the burning oil or gasoline.* If clothing catches fire roll, not run. Everyone should know where the fire extinguisher and garden hose are kept and how to use them. Everyone should know how to knot sheets and tie to the bed so they will hold, and how to come down hand over fist in case one is trapped by fire in an upper story. Everyone should know that the space nearest the floor is the freest from smoke, hence it is better to crawl out than walk out of a smoke-filled house (Fig. 187). A wet towel over the mouth and nose strains out the most irritant properties of smoke.

What to do for hemorrhage may be taught by showing a colored chart of the circulatory system and discussing the important pressure points. Make-believe injuries may then be treated (see page 435). This lesson should be accompanied by discussion of broken glass, razor blades, etc., as causes of serious cuts.

What to do in electrical accidents, together with careful inspection of the home for electrical hazards, may be taught even the very small child. The multiplication of electrical equipment in dwelling houses has caused a sharp rise in electrical fatalities and accidents and makes preventive education imperative.

Every child should know what are good *nonconductors of electricity* and how to avoid accidents with electrical equipment. Everyone should know how quickly to remove a body from a live wire without suffering shock himself. He must remember that dampness conducts and dryness interrupts electrical current; that all metals conduct and that dry leather, wool, and wood are good nonconductors. A pair of dry leather gloves, a folding leather pocketbook held open, or a wool sweater may be used as a holder to grasp a wire. One may use a dry wooden-handled ax or

hatchet to chop a wire and break the current. Then give artificial respiration (pages 459 and 460).

Prevention of Personal Accidents in the Home.—*Falls,* which lead the list of fatalities, may be avoided; first, by eliminating hazards such as shaky ladders, infirm chairs, stairways without railings, loose rugs on highly polished floors, dark passageways, doors opening abruptly on stairways, etc.; second, by great personal carefulness based upon the habit of always looking where one puts the feet.

Puncture wounds, always carrying the possible hazard of tetanus, may be generally prevented if everyone looks for sharp objects and never passes a board with a projecting nail or a piece of glass without picking it up.

Burns and scalds are almost entirely preventable. A runabout child should not play about a room in which there are any receptacles containing hot fluids. The adventurous, exploring instinct of the child, together with his clumsy, ineffective movements and lack of experience, make him especially likely to fall into or pull over pans, kettles, and tubs. A ghastly number of children perish each year from this type of accident.

Adults may be careless in the use of inflammable cleaning fluids. Such things should be used *only* out of doors and with due precaution as to friction. Fireplaces should be fully screened. Gas fixtures or gas appliances should be kept in order. Children should be trained as to the hazards of bonfires, stoves, and fireplaces. Matches have natural fascination for young children, because of the appeal both of the action and the color involved in their use. Only safety matches should be kept about premises where there are young children. Using matches under proper direction until a child's curiosity is satisfied is probably better psychology than rigid repression which may lead to surreptitious use.

An increasing number of deaths from monoxide suffocation occur each year. Each member of the family should be able to recognize every possible source of this treacherous, inodorous gas in the home, cooperate in its control, and know what to do in case of emergency (see page 459).

Fires in the home may be prevented: (1) by turning off all gas burners and electrical fixtures on leaving a room or the house, and

having all loose or defective fixtures repaired; (2) by keeping a watchful eye for possible sources of spontaneous combustion such as oily rags or floor mops; (3) by taking care of matches, hot ashes, cigarette stubs; (4) by making it a rule never to turn on an electric iron and "leave the room while it heats"—you may find the ironing board ablaze on your return; (5) by keeping inflammable substances of every sort outside the house or, at least, entirely away from fire and heat.

Poisons should not be kept in the house if it is possible to avoid it. Every poisonous substance should be thoroughly safeguarded from the moment of bringing it into the house. (1) It should be kept entirely apart from other commonly used drugs and solutions. (2) Every bottle containing poison should be marked for identification in the dark by a pin in the cork, using a triangular or peculiarly shaped bottle, pasting a strip of adhesive over the screw cap, or tying on a small bell. (3) Have few medicines and those kept in an orderly manner and accurately labeled. (4) Never save medicines left after illness. This is a frequent cause of accidental poisoning. Everyone forgets, or no one in the household ever knew, the contents of an innocent-appearing bottle or box of pills. (5) A table of antidotes and treatment for the common poisons should be pasted on the inside of the home medicine cabinet, and the designated means of treatment should always be available. (6) Never take medicine, gargle, or even rinse the mouth in the dark.

Safety with regard to motor vehicles (which furnish the largest number of accidents) may be summarized briefly under these heads: (1) Care of the vehicle as to brakes, steering wheel, condition of tires, tubes, wiring, etc., is imperative. (2) Proper care in driving includes: observance of traffic rules, careful discrimination in speed, refusal to overload car or permit riding on running board, refusal to drive when fatigued or sleepy or after consumption of alcohol. (3) The pedestrian should keep looking both ways when turning corners or crossing streets. He, too, must obey traffic rules and not "jaywalk." (4) Children should be trained in proper precaution while riding in cars, such as avoiding leaning on doors, avoiding contact with the car mechanism, etc. They should also be trained in crossing streets properly and taught to refrain from playing in the street. Both city and

country children should learn the traffic rules with their A. B. C.'s. Country children should learn to walk on the left side of the highway, facing traffic.

Home Inspection.—A trip over the house and premises with keen competition to see who can perceive the hazards first, and going over everything from chimneys to foundations, is very likely to result in the actual discovery of hazards. At least it will form associative patterns in the minds of the members of the family which will lead to future watchfulness.

The Home Safety Division of the National Safety Council issues the following self-check list, which may serve as a guide in family inspection.

Are stairs well lighted? (Lighting unit controlled from a point reached before the light is needed.)

Are handrails provided on stairs (especially cellar and attic)?

Are stair rugs fastened and free from wrinkles and curled edges?

Are gates placed at the top of all open stairways and porch steps if babies are allowed to crawl around?

Are stairs kept clear of toys, marbles, pencils, mops, or other objects?

Are attic, basement, and garage kept clear of rubbish?

Is a stand provided for the electric iron?

Is outdoor radio antenna equipped with a lightning arrester?

Is first-aid equipment kept in an accessible place?

Is medicine cabinet above reach of children and are all poisons segregated and carefully marked?

Are separate metal cans provided for ashes and rubbish?

Are fire-resisting guards in front of woodwork close to sources of heat?

Are oily mops and rags kept in metal containers?

Are inflammable liquids such as kerosene kept in tightly closed metal containers and away from heating systems and hot pipes?

Are steps and walks kept free of ice?

Is there a fire extinguisher in the house?

Kitchen.

Are matches kept in tin boxes and out of reach of children and mice?

Are gas cocks adjusted to turn smoothly but not too easily?

Are gas connections made with solid piping?

Are gas stoves equipped with pipes to chimneys?

Is stove (especially oven) kept free of food grease which may catch fire?

Are electrical fixtures in good repair (including wires)?

Are sharp tools kept in separate compartments and out of reach of children?

Living Room.

Are incombustible ash trays provided for smokers?

Is there a screen for the open fireplace?

Are scatter rugs equipped with pads to prevent slipping?

Bathroom.

Is handrail provided for help in getting out of bath tub?

Is rubber mat provided to prevent slipping in bath tub or shower?

Is hot-water faucet controlled to prevent scalding?

Are electric lights in bathroom controlled by wall switch, to prevent shock?

Nursery.

Is baby's crib provided with high sides and the railing sufficiently close to prevent baby's pushing head through partitions?

Is furniture steady and made with round corners?

Are small table and chair provided for baby to prevent using a regular chair?

Are toys of tested and safe nature?

Is nursery carefully lighted with attachments which cannot be handled by the child at play?

Is there provision made for sanitary use of baby's effects?

Preparedness Away from Home.—Every family leaving home for an auto trip should take a first-aid kit containing antiseptic, adhesive, bandages, gauze, cotton, and forceps. It is a good idea to fit up a small metal box and keep it with the tools. This kit should be taken along on picnics and excursions. Every school building should have an extensive first-aid equipment; every home-room should have first-aid drills; and safety education should permeate the curriculum.

References

Accident Prevention in the Home, Metropolitan Life Insurance Company,

LOSH, ROSEMOND: "The Child's Greatest Hazard," *The Trained Nurse and Hospital Review*, April, 1935.

MEYERS, GARY CLEVELAND: *Training the Toddler in Safety*, Greenberg, Publisher, Inc., 1935.

Parents' Magazine, March, 1935.

Printed matter issued by the Kansas City Safety Council, Kansas City, Mo.

Publications and outlines of The Division of Home Safety, National Safety Council, Rosemond Losh, Chairman, Kansas City, Mo.

Publications of The National Safety Council, Chicago.

ROGERS, JAMES F.: *Safety and Health of the School Child*, Office of Education, Department of Interior.

The Home That Is Safe, Metropolitan Life Insurance Company, 1931.

Will the Rising Toll of Accidents Hit You?, Metropolitan Life Insurance

CHAPTER XXXIX

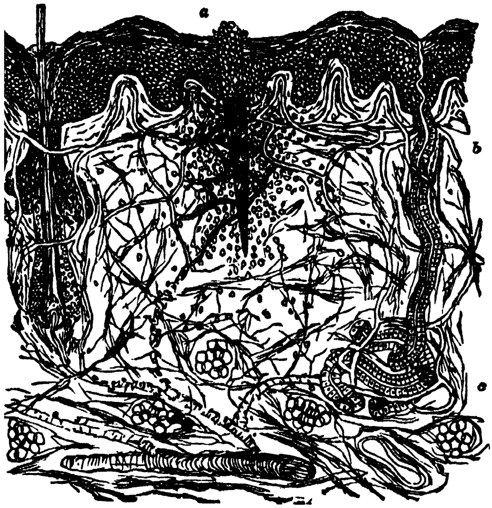
WOUNDS

The Skin.—The skin is a remarkably complex organ having many functions, one of which is to provide a covering practically impervious to the entrance of germs (see page 182). The diagram in Fig. 40, page 63, shows the surface layer of impervious, scalelike cells, held flat with water-resisting, cementlike secretion. It shows the clever arrangement of sweat and oil glands and hair follicles, making the entrance of foreign matter difficult. However, clogging the entrances to these glands with dirty, infectious matter may cause pimples, boils, abscesses, or carbuncles. A small puncture or break in the skin from a pinprick or hangnail may admit germs which may cause local infection, general blood poisoning, or tetanus.

Because of its imperviousness to fluids the skin is a protection against poisons. Strong antiseptic solutions may be safely used on the skin which would be dangerous if used upon an open wound (see page 369).

When injured the skin and underlying tissues have remarkable capacity for repair. We have seen (page 111) how injury stimulates blood clotting, which in itself provides a favorable medium for the growth of new cells. This is one reason a limited amount of bleeding is considered to be a good thing in some injuries (see page 434). The scab that forms over any small hurt which may be left exposed to the air is a perfect surgical dressing. The mechanism of repair is shown diagrammatically in Figs. 160 to 163.

When injury occurs to cells of a given tissue the adjacent cells reproduce others of a similar kind. If there is extensive damage, part of the cells will be replaced with connective tissue which remains as a "scar" (Fig. 163). The greater the number of cells injured and the slower the process of healing the greater the



[illegible]ction through skin of a guinea-pig eight hours after a wound; (*a*) the wound filled with a clot with round celled infiltration, blood capillaries, thrombosed; (*b*), (*c*) sweat gland; (*d*) a hair follicle. (*Parker and Breckinridge, Surgical and Gynecological Nursing, J. B. Lippincott Company,* 1916.)

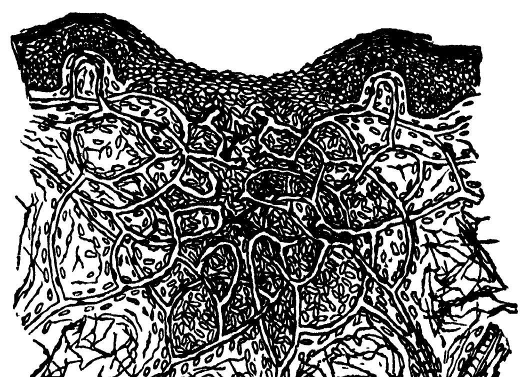


FIG. 161.—The same at a later stage; new blood vessels forming. Epithelium united on surface. (*Parker and Breckinridge, Surgical and Gynecological Nursing, J. B. Lippincott Company,* 1916.)

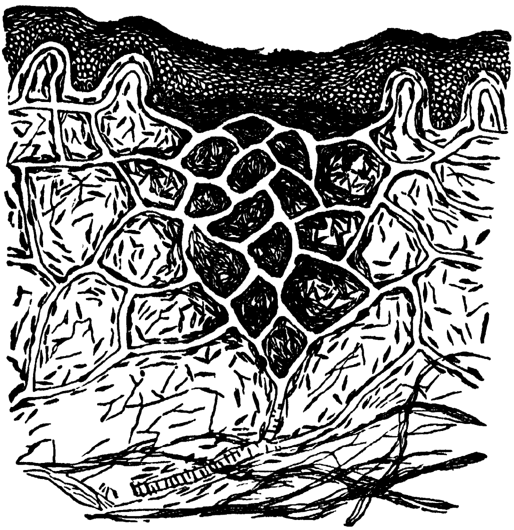


FIG. 162.—The same later, gap filled with new blood vessels and new connective tissue. (*Parker and Breckinridge, Surgical and Gynecological Nursing, J. B. Lippincott Company,* 1916.)

FIG. 163.—Scar formed in the wound. (*Parker and Breckinridge, Surgical and Gynecological Nursing, J. B. Lippincott Company,* 1916.)

amount of scar. A clean wound or a wound with few bruised or torn tissue cells tends to heal very rapidly by "first intention," and leaves little trace.

A wound which is very extensive or which becomes infected heals by first filling with large new embryonic cells or "granulation" tissue. This afterwards becomes converted into the specific bone, muscle, skin, etc., which the part requires.

Sometimes nature does not regulate the formation of granulation tissue with her usual exactness, especially in old, chronic, or slow-healing wounds, and too much granulation tissue ("proud flesh") is formed. It may be necessary to cauterize this tissue (burn off with heat or chemical) to check its growth.

Kinds of Wounds.—1. *Incised or clean-cut wounds* bleed freely and are not likely to become infected.

2. *Torn, contused, or lacerated wounds* contain more or less dirt and bruised and injured cells, and are very likely to suppurate and heal slowly.

3. *Puncture wounds* are especially likely to have tetanus (lockjaw) germs carried into them, and are among the most dangerous of accidents.

Dressing Wounds.—If possible every wound which involves much bruising or extensive bleeding should be dressed by a physician. Certainly every puncture should be seen by a physician on account of the danger of lockjaw (see page 186). Every homemaker, however, should acquire the technic of making an exquisitely clean, precise surgical dressing. Her technic should be just as careful in dressing small injuries as in dressing a large wound. The steps in dressing a wound are as follows:

1. *Expose the Injury.*—Place the injured person in a comfortable position and expose the wound by carefully ripping, cutting, or otherwise removing surrounding clothing. Do not be in undue haste; do not unnecessarily injure the clothing or cause unnecessary pain.

2. *Assemble Equipment.*—Assemble everything to be used and arrange in an orderly manner on a table, chair, board, or other convenient place This will include sterile water or antiseptic solution; container for pouring same (water remaining in the teakettle after boiling is practically sterile); for washing the region of the injury and dressing the wound, sterile gauze or cotton from the medicine cabinet, or clean rags which have been freshly ironed with a very hot iron or boiled in a small basin of water. A bandage and an open newspaper for receiving waste will be needed.

3. *Sterilize Hands.*—Scrub the hands very thoroughly with hot water, soap, and hand brush, scraping thoroughly under fingernails while scrubbing hands. Wipe with freshly ironed towel or dry in air without wiping.

4. *Cleanse Parts Surrounding the Injury.*—Carefully sponge the parts surrounding the injured area, wiping away from the edge so as to avoid getting any foreign material into the wound.

5. *Cleanse the Wound.*—This is best done by washing freely with freshly boiled water or a very mild antiseptic solution. A small wound may be washed with a sterile medicine dropper. In case of a larger or contused or lacerated wound the solution may be poured from a sterile pitcher. Bits of sterile gauze or cotton may be used to dislodge dirt and debris. It is better to handle the gauze with the splinter forceps from the home medicine cupboard, which may for the purpose be quickly sterilized with the antiseptic. Never use gauze or cotton pledgets a second time or dip back in solution. Drop each bit as used on the open newspaper. Burn the paper and the waste.

6. *A small wound or scratch* should be encouraged by squeezing to bleed freely, then wiped dry with a bit of sterile gauze, cotton, or clean rag that has been freshly ironed with a hot iron or boiled. It is then painted with tincture of iodine or with mercurochrome, and bandaged with a dry, sterile bandage, or, if small, left to form a scab in the air.

7. *Punctured Wounds.*—A punctured wound made by splinter, nail, sharp instrument, etc., should be encouraged to bleed freely, should be cleansed as thoroughly as possible with antiseptic, and should be shown at once to a physician, who will open the injury and sterilize it. In all cases of doubt he will give preventive or immunizing doses of antitetanus serum.

8. *Final Dressing of Wounds.*—After the wound is thoroughly clean it should be dried by pressing edges together gently, to squeeze out all the moisture possible. Then cut a pad of sterile gauze, cotton, or freshly ironed clean rags, taking care that the surface of the pad which is to touch the injured place has touched nothing whatsoever—fingers, table, or anything else. Bind on firmly with a roller bandage; or a small bit of sterile gauze may be placed directly over the cut and strips of adhesive used to draw the edges firmly together and hold the gauze in place. The adhesive should not touch the wound.

9. *Renewing Dressings.*—Unless pus forms or the wound becomes swollen and painful, or the dressing becomes loose or soiled, it should not be disturbed until the injury is entirely healed. If the wound discharges, it should be dressed daily or oftener, being cleansed and dressed on each occasion as it was the first time.

Hemorrhages and Their Treatment. *The Circulation.*—The heart pumps fresh blood through the arteries and their branches to all parts of the body and receives it back through the veins. The minute vessels which connect the arteries with the veins are called capillaries (Fig. 41).

The arterial system resembles a branching tree which sends one main trunk up each side of the neck to the head, and others into each arm and into each leg. These large trunks are found in the most sheltered and protected places, behind the collarbone, in the axilla or armpit, along the inner surface of the elbow and wrist, under the inner surface of the thigh, and under the knee.

The venous system retraces the path of the arteries; wherever a large artery is found a large vein lies near it; likewise the small veins and arteries are thoroughly intermingled. For this reason it is rarely that an artery is severed without a vein of similar size being also injured. The blood from a severed artery of any size will flow in spurts coincident with the heartbeats. Venous blood flows more steadily. To stop arterial bleeding pressure must be applied between the injury and the heart. To stop bleeding from a large vein pressure must be applied on the side away from the heart. As a matter of fact one never sees "bright red" or "dark red" blood as described in many books; what one sees is "mixed" blood. Since arterial blood comes directly from the heart, arterial hemorrhage is more serious; usually, therefore, the pressure should be made between the injury and the heart. Checking the arterial hemorrhage will, automatically, check the accompanying venous hemorrhage.

To Check Severe Hemorrhage. 1. BY MANUAL PRESSURE.—When blood is either gushing or flowing freely from a wound very prompt action is necessary to prevent the loss of a serious or even fatal amount of blood. The rescuer should think quickly where the main artery lies which supplies the injured part and press firmly with the thumbs or the heel of the hand over the main artery, feeling along the bone until the place is found where pressure checks the flow. If there is a second person at hand he should be instructed to uncover the place of the injury carefully and prepare a mechanism for maintaining pressure. If the rescuer is entirely alone he will be compelled to release his pressure and act as quickly as possible. He should think out all details while applying the temporary pressure. Often the injured person himself can render some assistance. To check bleeding from a severed jugular vein or large artery in the neck or from a head injury, deep pressure with the thumbs must be maintained

while patient is rushed to the doctor, as the place cannot be bandaged (Fig. 168).

2. By Pressure and Flexion.—When the injury is below the elbow or below the knee, roll a soft pad, such as a stocking or several handkerchiefs, and place in the bend of the elbow or under

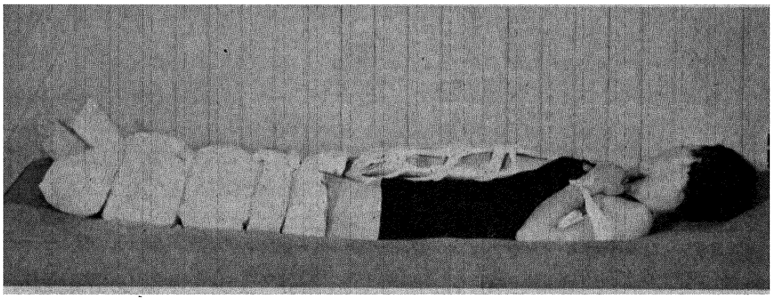


Fig. 164.—Flexion and pressure pad on left arm for control of hemorrhage in hand or forearm. A pillow splint applied to left leg; a board splint on right arm.

the knee; then flex the arm or leg as far as possible and tie in this position with a strip of cloth around the doubled-up arm or leg (Fig. 164). Be sure that the pad is thick enough actually to press upon the blood vessel which is bleeding.

Fig. 165.—The tourniquet.

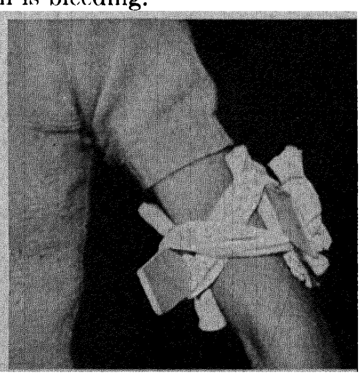


Fig. 166.—The Volker stick.

3. By Use of a Tourniquet.—The tourniquet can be used where it is possible to apply it between the wound and the heart. The upper arm and the thigh are the most favorable places. Locate the place above the wound where pressure will stop the bleeding. Place here a small pad, such as a folded handkerchief.

Knot a handkerchief loosely about the arm or leg at this place with the knot over the pad. Now slip a lead pencil or small stick in the knot and twist until the bleeding stops or nearly stops. Do not make any tighter than absolutely necessary. Release the knot every few minutes in every case, as the continued pressure may do lasting injury to both nerves and blood vessels (Fig. 165).

4. By Use of a Board Tourniquet or "Volker Stick."—This is a good arrangement where the help of a doctor cannot be had for some time or where extensive bleeding must be controlled, since this does not shut off the entire circulation from the arm or leg as does the tourniquet.

Two pads are prepared and placed, one over the proper point to control the bleeding, the other directly opposite on the other side of the limb to prevent bruising. Two short boards or flat sticks are now applied over the pads and the ends bound firmly together with strips of cloth or cord (Fig. 166).

5. Elevation.—Elevating the limb checks force and velocity of circulation and helps control hemorrhage (Fig. 168, 4).

To Control Hemorrhages from Small Wounds.—Firm pressure directly over the wound with a pad of sterile gauze, cotton, or freshly ironed or boiled rags will usually check moderate hemorrhage from small wounds. After cleaning the injury this pad should be put on firmly but not tightly enough to stop the circulation. The resulting clot, as has been said, is the best possible dressing and should not be disturbed. Only sterile dressings should ever be applied directly to a wound. In case of bleeding after the removal of tonsils a small pledget of sterile cotton or gauze grasped with forceps from the medicine case may be pressed firmly against the bleeding point and held until the doctor comes.

Internal Hemorrhage. *Bleeding from the Nose.*—Ordinary bleeding from the nose can be stopped by pushing a little pad of tissue paper or roll of soft cloth under the upper lip, then pressing firmly with the forefinger laid along the lip. This compresses the anterior nasal blood vessels, which are usually the source of bleeding. If this does not stop it in a few minutes put a cold compress on the back of the neck to reach the posterior blood supply. Salt water, vinegar and water, tea, or alum water, or any mild astringent, may be snuffed up the nose and will tend to hasten the clotting process. Prize fighters breathe in forcibly

through the nose and then spit out the blood; the air in this case causing clotting. In extreme cases the nose must be packed with cotton or gauze very gently introduced to avoid injuring the turbinates (Fig. 46) and pressed from the outside by pinching the

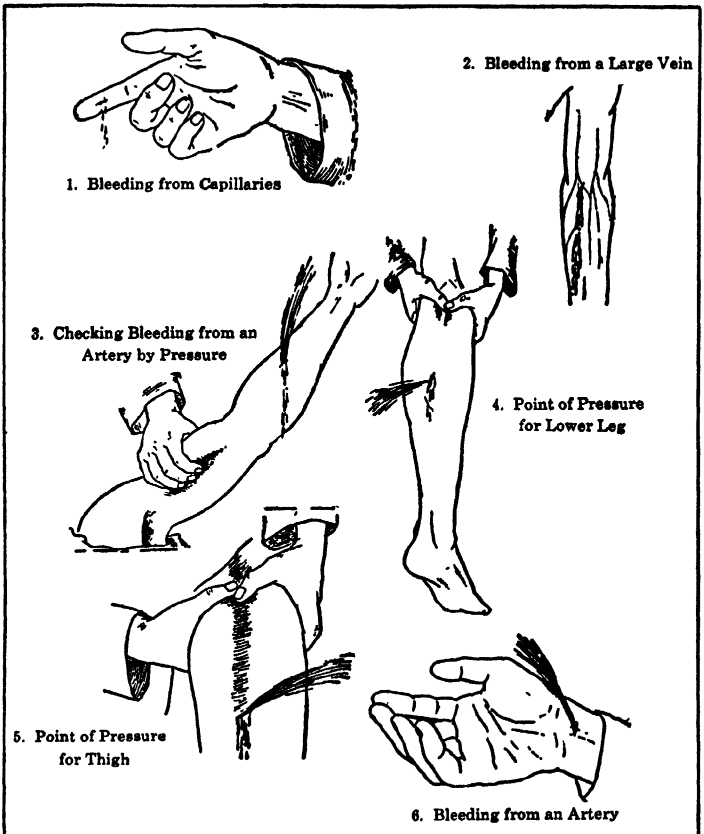


Fig. 167.—Control of hemorrhage. (*The American Red Cross.*)

nose. The best way to pack a nostril is to insert small loops of sterile finger bandage or strips of gauze, pushing each loop into place with the handle of a crochet needle or other suitable stick.

The injured individual should not blow the clot from the nose until all danger of recurrence of bleeding is past.

Bleeding from Lungs.—Blood from hemorrhage of the lungs is frothy and bright red, and is usually brought up by coughing. While bleeding from the lungs is an alarming symptom, neither the patient nor his family should give way to panic and fright.

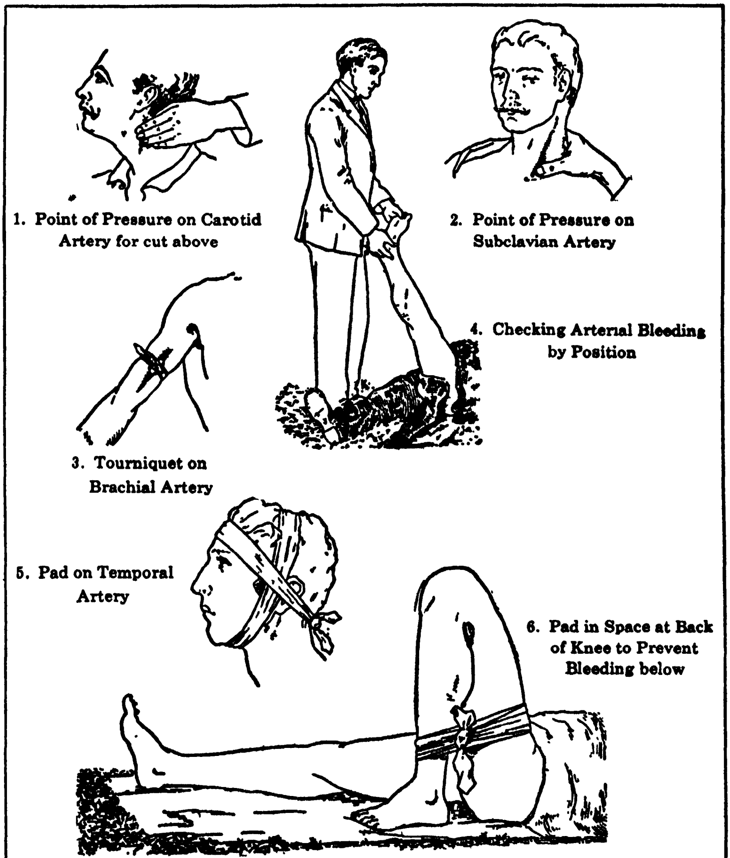


FIG. 168.—Control of hemorrhage. (*American Red Cross.*)

The patient should lie in bed with chest and head raised on plenty of pillows. Give all the cold air possible. In winter draw the bed up to a window, cover warmly, and admit cold air. In summer let an electric fan blow over a cake of ice onto the patient's face; if ice is not available blow air through a suspended wet

sheet or towel. Keep the patient's body warm. He may suffer from air hunger and not want the weight of the bed clothing upon his chest. Sweaters and pajama jackets may be put on backward. This is all the family can do until the doctor arrives.

Bleeding from the Stomach.—Blood from the stomach is usually dark from contact with the acid juices of the stomach. It is commonly flaky or coagulated and is called "coffee-ground vomit." In ulcer or tumor of the stomach a copious hemorrhage of bright red blood may occur. The patient should keep perfectly quiet and may try swallowing ice. Also, an ice bag may be applied over the stomach. Send for the doctor. Special care is necessary in all use of cold to prevent general shock. The body, except for the site of application of the cold, should always be kept quite warm.

Bleeding from the bowel, if red, is usually caused by piles (hemorrhoids). An injection of very hot or very cold water will usually stop it. In typhoid fever hemorrhage from the bowel is one of the dreaded complications. In this case no injection should be given. The blood may be dark and glairy resembling tar, owing to mixture with the intestinal secretions. Keep the patient perfectly quiet and send for the doctor without delay.

Hemorrhage from the uterus may occur with a miscarriage at any time during pregnancy or immediately following childbirth. Any sudden or unusual or especially copious bleeding from the uterus, whether the woman believes herself to be pregnant or not, should receive prompt medical attention. Serious complications and aftereffects may thus be avoided.

Serious hemorrhage may follow either premature or full-term labor. The uterus (womb) contracts like an overstretched rubber bag after the child and afterbirth are removed from it. This is nature's way of closing the ends of the torn blood vessels and stopping the bleeding. The contracted uterus can be felt through the lax abdominal walls as a hard round ball almost as large as the child's head. Occasionally after severe exhaustion or for other reasons the uterus may relax during sleep or during the reaction following labor. The sudden appearance of copious bleeding accompanied by pallor, restlessness, an anxious expression, and sighing should be the signal for prompt action. The following things may be done: (1) Send for the doctor with all

speed. (2) Place the baby to the breast, as the uterus usually contracts reflexly when the child nurses. (3) Squeeze and knead the uterus through the abdominal wall. This should be done instantly on discovery of the hemorrhage. The attendant who does this may direct others to call the doctor and place the baby to the breast. (4) Have someone lift the foot of the bed and support it on a chair so the patient's feet will be higher than her head. (5) Place over the lower part of the abdomen a rubber water bag filled with ice water or cloths wrung out of ice water. (Again, keep the body warm.) (6) Keep the patient absolutely quiet until seen by the doctor.

Bleeding from Nasal Catarrh.—Blood from nasal catarrh sometimes drops into the back of the throat and is swallowed or expectorated. Sometimes this is taken to be a sign of an internal hemorrhage. It simply indicates that the individual should see a nose and throat specialist.

Bruises are actually hemorrhages under the skin caused by the crushing of small blood vessels without breaking the skin. The blood thus set free cannot escape, and so passes through chemical changes in the tissues and is slowly absorbed (see page 107). Immediate relief from pain is secured by immobilizing the injured part if necessary, and by the application of continuous heat or cold (see page 321). The absorption of clotted blood from the tissues may be hastened by alternate applications of heat and cold and in later steps by carefully applied massage. A bruise should be massaged in the following manner: Carefully and gently rub from the very edges of the injured area, and always away from the injury, using a firm, stripping motion as if smoothing out wrinkles. It must be emphasized that one manipulates the tissues surrounding the bruise and not the injury itself. This hastens absorption and tends to prevent stiffness. Go all around the area, approaching the center only as fast as the soreness leaves. If properly done, it should not be painful. Never manipulate injured tissue directly, and never cause pain.

CHAPTER XL

SPRAINS, FRACTURES AND DISLOCATIONS

Violence applied to the framework of the body may result in forcing joints out of their sockets (dislocation), in overstretching or straining or tearing ligaments which hold joints in place (sprain), or in the breaking or fracturing of bones (Figs. 170, 171).

Sprains.—Sprains are sometimes more painful and take a longer time to heal than the actual fracture of a bone. Sprains should be bandaged so that the injured part cannot be moved (Fig. 169). A sprained ankle or wrist may be put in a basin of hot water for a 20-minute period several times a day and the water kept as hot as can be borne. The injured member must be either held on a pillow or bandaged so that movement is prevented. The weight of the body should not be supported on a sprained foot as long as it is painful. If it is necessary to go about a crutch must be used.

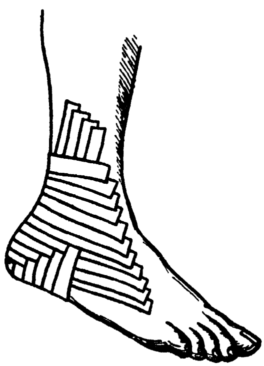


FIG. 169.—Method of strapping a sprained ankle.

Fractures.—The symptoms are sudden loss of motion with pain and scratching or scraping of ends of bone on movement of the part affected. The bone may be broken squarely off or slantwise with splinterlike ends, or it may be merely splintered, or cracked, and not broken entirely through (Fig. 170). If it is bent but not broken, we have what is called a "green-stick fracture," a type which often occurs to the soft bones of children. A bone may be broken in several pieces, some of which may protrude through the skin. This is called a compound, comminuted fracture.

Of course, a doctor must be called to set a broken bone. In the

be taken to the physician. He should not be hastily or carelessly moved. Time should be taken to investigate carefully the extent of injury. Cut away clothing or rip seams. The ripping of seams will usually allow the free removal of clothing without destroying it. Place the patient in the most comfortable position possible just where he has fallen; when the exact location of the injury has been determined gently straighten the limb and apply some kind of splint. A splint is something stiff which is long enough to go well above and below the break and keep the broken ends from rubbing on each other and punching into the flesh. A board, a bundle of small sticks, an umbrella, a roll of cloth, such as a lap robe, raincoat, etc., a folded newspaper, anything which can be obtained on the spot, may be used and bound above and below the break with strips of petticoat, stockings, or string. A heavy blanket makes a good splint for a broken leg. Draw the blanket, folded lengthwise, underneath the leg carefully until the leg rests crosswise in the center. Beginning at the ends, roll the blanket firmly about umbrellas, canes, or sticks (if possible) and bring the rolls closely to the leg on either side. Bind to the leg by tying at intervals with strips of clothing. The firmer the splint the more easily and safely the patient may be moved. A pillow or cushion bound firmly to an arm or leg makes a very good splint (Fig. 164). In extreme emergency the injured limb may be bound to the uninjured one. A splint to be effective must extend beyond the adjacent joints.

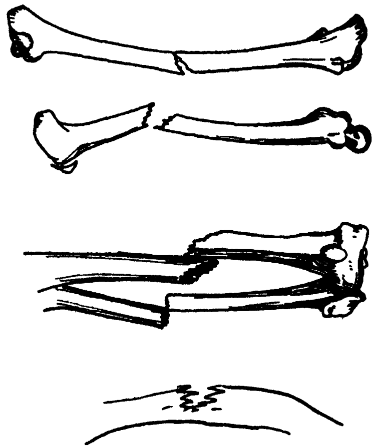


FIG. 170.—Types of fractures.

A fracture of any kind should always be examined with an X-ray after being set. By this means the surgeon can be certain that the bones are properly adjusted.

Dislocations.—If a joint is forced out of its socket, an immediate attempt may be made to replace it by pulling on the extremity in such a direction as to let it slip back. When the accident has

just occurred, and the sufferer is faint and relaxed, it will go back more easily than it will after he recovers himself and the muscles contract. If one is unable to do this by using a reasonable degree of force, he must wait for a physician. An anesthetic is often necessary to relax the muscle pull if the joint has not been reduced at once. A dislocated finger may be reduced by the injured person himself if he has the courage to pull firmly upon it.

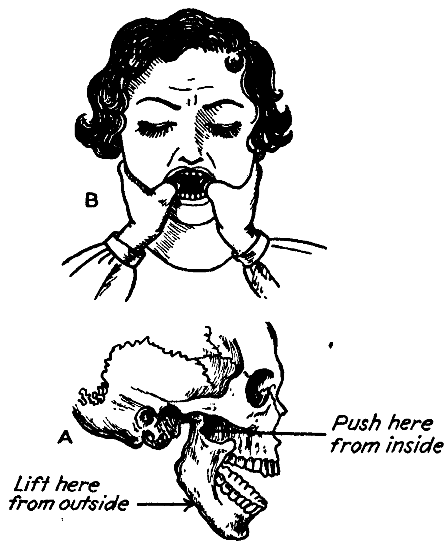


FIG. 171.—*A*, Dislocation of the jaw. *B*, Method of reduction. (*Adapted from Morrow, The Immediate Care of the Injured, W. B. Saunders Company.*)

Some individuals have a slight looseness of the ligaments of the jaw which permits the lower jaw to slip out of the sockets on yawning. A companion may wrap his thumbs with handkerchiefs, and, by grasping both sides of the jaw firmly with the thumbs inside and the fingers under the jaw, he may by pressing, pushing, and raising cause it to snap into place (Fig. 171).

CHAPTER XLI

BURNS, SCALDS, AND FREEZING

Burns and scalds are very painful injuries and are often serious. A burn or scald involving as much as one-half of the surface of the body is usually fatal. A deep burn affecting a much smaller area may cause death from shock, from dehydration because of seepage of serum from burned surface, or from internal congestion of vital organs, or death may occur later because of absorption of toxins from dead tissues, or from septic infection.

Putting Out Fire.—If the clothing catches on fire the victim should remember that flames always rise, and should therefore throw himself on the ground or floor and roll over and over to prevent their rising to his head and face. Also by so doing he may be able to extinguish the flames. In any event his chances are much better than if he should rush about fanning the flames while calling for help.

Rescuing Persons with Burning Clothing.—Look quickly for something to throw about the person to smother out the flames. A blanket or heavy fabric is best. One should not hesitate to strip off his own outside clothing if necessary, and he should not waste time making a choice. Often a small flame may be smothered by a towel or quickly beaten out with the hands.

Entering a Burning Building.—Cover the mouth and nose with a wet cloth. A wet towel wrapped about head and neck, leaving only the eyes exposed, is useful, as it protects the hair and does not come off easily. The 12 inches next the floor in a burning room is relatively free from smoke; therefore crawl on the floor if the smoke is dense; in coming out crawl backwards dragging the person rescued after you or carrying him on your back (Fig. 187). This is much safer than trying to walk upright carrying the person through the smoke.

Removing Clothing.—Carry the patient to a suitable place, and if he is greatly shocked or prostrated, first give fresh air and

stimulants and, perhaps, apply heat to the feet. Do not hesitate to cut away clothing from the burned surface, but do not be too frantic to uncover and see the burn.

The First Dressing.—If an arm or foot is burned, quickly prepare a large basin of tepid water (a dishpan or foot tub or clean pail will answer), add salt in proportion of about one tablespoonful to the gallon of water or a similar amount of soda, or both, and gently lower the burned part into this. This shuts away the air and gives considerable relief. Then, without taking out of the water, carefully and gently cut away the clothing, using great care not to pull away the skin or flesh. A clean solution may then replace the one first used. The injured part may be left in the clean salt-and-soda solution and the sufferer made as comfortable as possible until the doctor arrives.

If the body has been badly burned one of the best things to do is to pick up the injured one carefully and lay him in a bath tub of tepid water, clothing and all; then gently cut away the clothing, taking plenty of time and working carefully. Clean water may be kept flowing in, and the used water out, until the procedure is completed. Salt and soda may then be added and the victim left submerged in clean water until the doctor reaches him. After the burned areas are exposed it may seem feasible to move the injured person to a bed. The body should be dried and the burns covered with wet soda or salt water compresses and kept wet until seen by the doctor. It should be remembered that the immediate danger is from shock. The body must be kept warm. Since serum escapes in large amounts from freshly burned surfaces, hot drinks should be pushed to the limit.

Dressing Small Burns.—A wet baking-soda compress, or a compress soaked in weak tannic acid solution, tea, or wet tea leaves and covered with a bandage makes a very good dressing for a small burn.

Blisters.—If small, these may be let alone. If large, they should be pricked at the margin with a needle which has been sterilized by holding in a flame. The skin of the blister makes the best possible covering for the burn, and may be left whole if possible, being covered with dry, sterile gauze to prevent injury. When the skin of the blister is torn, or when the blister is large, it is better to cut away the blister with sterile shears and dress as described for large burns.

Dressing Large Burns.—If a large surface is left raw and sensitive, and the individual must go to the doctor, a dressing made by dipping a thick pad of sterile gauze in a solution of soda (one teaspoon to pint of boiled water) may be applied wet. This must be kept quite wet by occasionally pouring a little of the solution under the edge of the dressing. The dressing must not be allowed to dry or stick on a burn. Where medical attention is not available at once, a tannic acid compress may be used, or tea, or wet tea leaves. No substance which cannot easily be washed off or soaked off should be used as first aid. It is extremely painful and difficult to cleanse and make ready for permanent dressing a burn which has been covered with grease or flour or other insoluble substances.

A method of dressing burned surfaces much used in the World War is to coat the surface with a flexible wax, a paraffin preparation which does not stick to the burn and which forms a delicate airtight, sterile covering, under which the injury rapidly heals. Burn wax is solid at body temperature and melts at a temperature very slightly higher. It is sprayed on or painted on and is usually applied by a physician or a trained nurse.

Another method which is now receiving favorable attention is the coagulation of the surface with 2 per cent tannic acid solution. This is applied as a wet compress frequently renewed until a thick dark coagulum forms. The surface must first be thoroughly sterilized, as tannic acid is not antiseptic; in severe burns the cleansing should be done under an anesthetic. The coagulum is then not disturbed until healing is complete.[1] The special virtue of this method is that the usual seepage of fluid from the tissues is prevented. Tannic acid powder may be kept on hand, but solutions deteriorate quickly.

Picric acid in 1 per cent solution or picric acid gauze may be kept on hand for burns. Picric acid is bright yellow and stains linen. It is applied as a wet dressing to burns which are not too large. It smarts when first applied, but gives very quick relief. It is not used on large surfaces because of the danger of absorption (see page 369).

Chemical Burns.—If burns are due to carbolic acid, apply something containing dilute alcohol, if it is possible to obtain it, as

[1] MITCHNER, PHILIP, H., *The Modern Treatment of Burns and Scalds*, William Wood & Company, 1935.

alcohol stops the action of carbolic acid at one. If nothing of this kind is at hand, wash off the acid and apply a wet soda-water dressing.

Acid burns caused by sulphuric, nitric, or hydrochloric (muriatic) acid should have an alkali applied as quickly as possible. Soda or borax or lime water is usually available. Soapsuds may be used in an emergency.

If burns are caused by an alkali, such as lye, slaking lime, caustic soda, or caustic potash, apply an acid as quickly as possible. Dilute vinegar or lemon juice is usually obtainable. Great care should be used to have the neutralizing solution weak enough not to be irritating.

After neutralizing the action of the chemical dress the injury as in the case of any other burn.

Freezing. *General Freezing.*—A person overcome by cold with parts of the body frozen should be undressed in a cool room and rubbed with brisk but gentle friction and massage all over. Give stimulants as soon as patient is able to swallow. When thoroughly thawed he may be gradually covered and warmed. The best method for accomplishing this is to place him in a tub of tepid water and gradually warm the water until it reaches the limit of comfort. Then put him between blankets, give him hot nourishment, and leave him to rest.

Local Freezing.—Avoid sudden thawing of exposed part, but rather protect it from outside warmth by applying cold water. The thawing should be done by the blood from the body, which will slowly warm its way into the frozen blood vessels. To thaw any part of the frozen flesh by application of outside heat is likely to result in rupturing some of the blood vessels. If it is thawed too rapidly chilblains will result. After thawing, continue gentle manipulation until thoroughly warm. If the skin is broken or becomes sore, use any simple antiseptic application. The rubbing of frozen tissues should be done very gently by a mere plastic manipulation, rather than by friction, as it is very easy to bruise or injure the tissues through overzeal. Arctic explorers are said merely to apply the warm hand without rubbing.

Chilblains result from prolonged exposure to cold, serious freezing, or hastily thawed freezing. For some time after such

an experience the parts may burn and tingle on becoming warm after exposure to cold. For chilblains, paint with iodine or ichthyol ointment or apply a compress wet in witch hazel, alcohol, or camphor. Wear loose shoes and avoid sudden heating of the feet when cold. Remove shoes and rub the feet instead of holding them to heat.

CHAPTER XLII

FOREIGN BODIES, BITES, AND STINGS

Foreign Body in the Eye.—When a foreign body, such as a grain of sand or a cinder, gets into the eye, it usually lodges near the edge of either the upper or the lower lid or in plain sight upon the eyeball. The victim of such an accident, mustering instant self-control, should refrain from rubbing the injured eye. He may, by rubbing the other eye, encourage the flow of tears. He may often get relief by seizing the lash of the upper lid and pulling it well down over the lower lid while winking. The lashes of the lower lid act as a brush, while tears provide a normal salt irrigation, and often the object will be flushed out and caught by the lashes. If unsuccessful he should keep the lid as nearly closed as possible and proceed quietly to a place where aid may be had. The operator should work with clean hands and have gauze or a clean handkerchief in readiness. The patient should sit in a good light with his head thrown back while the operator stands behind the chair. Usually the patient can indicate the location of the substance as being under the upper or the lower eyelid, or to the right or to the left of the center. The operator should pull back the lid in the region indicated and look carefully both on the inner surface of the lid and on the eyeball, and he should expect the object to be small. An inexperienced person often gives up the search because no relatively large object is to be seen. When the speck is located, it may be picked up with a sharp corner of the folded handkerchief, care being taken not to brush the object more deeply into the mucous surface. This procedure will be found effective in nine cases out of ten. If the object adheres to the upper lid the latter should be everted (Fig. 172).

If this is not successful, the eye may be flooded with warm boric acid solution or boiled salt water. The solution should be tepid or "blood-warm." The patient lies upon his back while the

operator separates the lids with the first and second fingers of the left hand and gently drops in several pipettefuls of the solution, which may be caught in a folded towel held to the cheek. In the absence of a pipette a clean teaspoon or small pitcher may be used to dribble in the solution.

Foreign Body in the Ear.—A small syringe or pipette may be used to flush the ear canal while a basin is held under the ear. The solution may be poured in from a small pitcher, until the object comes away. No one should probe into the ear, as there is great danger of injuring the eardrum. If a seed is in the ear

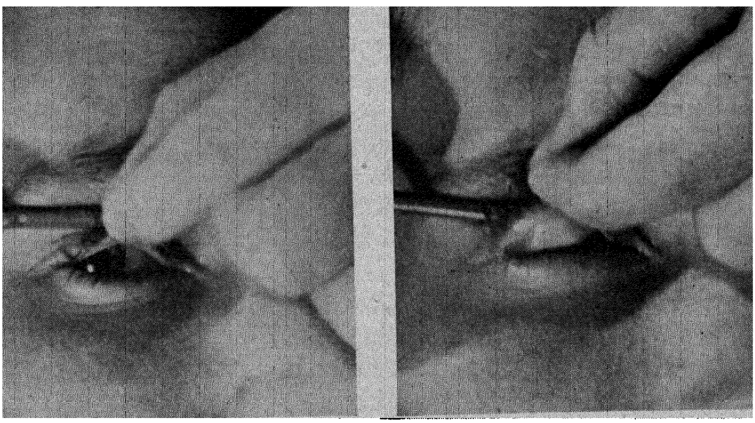


FIG 172 —Everting the upper lid.

it will be safer to use warm oil, since water may cause it to swell. If the object can be seen it may be grasped with splinter forceps. A live insect, it is said, may be persuaded to come out by holding a light bulb or other hot object near the ear (Fig. 119). Pressing firmly into the hollow behind the ear with a finger the instant one feels an insect entering the ear, may prevent it from going deeply into the canal. It is said that a tiny bit of vaseline on the end of a stick, carefully inserted in the ear while pulling the lobe to straighten the canal, may adhere to the foreign object.

Foreign Body in the Nose.—One may blow through the obstructed nostril while holding the other nostril closed. Sneezing may be provoked by inhaling pepper or powdered spice of some kind. (Protect the eyes with a wet cloth while doing this.) A

doctor should be consulted if this device is not successful. Force should never be used.

Foreign Body in the Throat.—If a child chokes on something a smart slap on the back or shaking by the heels will usually dislodge it; next, one may try to reach the object with the splinter forceps or with a hairpin, but this should be done carefully and gently.

If the object has really entered the windpipe one should try to control the patient's panic and get him to relax and try to breathe calmly in spite of it. He should go to a doctor with all speed.

If a child swallows some such article as a button or ring, a bulky and rather dry diet will take care of the situation. The stools should be watched until the article comes through. If the object has sharp corners or points it is safer to have a physician locate it and watch it with an X-ray.

Insect Bites and Stings.—Insect bites, such as stings by wasps and bees, should be dressed with a pad of gauze, soft clean cloth, or cotton wet in soda solution, alcohol, ammonia, lime water, soapsuds, borax, or other mild alkali. Bites from poisonous spiders, tarantulas, or other venomous creatures should be treated like snake bites and the victim receive antivenom serum (if available) as speedily as possible. In case of massive injury, such as that of a child encountering a swarm of bees or wasps, the body should be immersed in a tepid or warm bath, strongly impregnated with baking soda. Stimulate and treat as for shock.

In general there is an extravagant fear of spider and tarantula bites. With the exception of the bite of the "black widow" few, if any, such bites produce fatal results. The "black widow" spider (latrodectus mactaus) is receiving so much sensational publicity that a special mention may be in order. This spider seems to be widely distributed through the South and more or less frequently encountered in other regions. In 1934 A. W. Blair permitted himself to be bitten by a latrodectus mactaus in order to make firsthand observation of the symptoms.[1] He reports three stages: The first lasting about 30 minutes, which he terms the stage of lymphatic absorption; the second stage, vascular

[1] Blair, A. W., "Spider Poisoning," *Archives of Internal Medicine*, December, 1934.

dissemination, was characterized by severe muscular and abdominal pain, lowered blood pressure, and weak heart action. This stage lasted with him for two or three hours, followed by the stage of elimination and gradual return to normal. While the proportion of fatalities is greatly exaggerated there is no doubt that the bite may be fatal to children, to those having low resistance, or to persons under the influence of alcohol.

All authorities caution strongly against the traditional use of alcoholic stimulants as well as all sedatives and most stimulants. Hot baths give marked relief from the agonizing muscular pain. No medication of any kind should be prescribed by the lay person.[1] Medical aid should be summoned with speed.

Snake Bites.—There are only four varieties of poisonous snakes in the United States: the rattlesnake, the copperhead, the water moccasin, and the coral snake. All have relatively thick bodies, clubbed tails, triangular heads, and slit-shaped eyes. Most other varieties of snakes are said to have round eyes. The rattlesnake is found all over the United States; the coral snake only in the South. The copperhead and the water moccasin are found in the middle and southern states.

A strong healthy person is not likely to die from a snake bite. About one in every ten persons bitten dies. If anyone is bitten by a poisonous snake, a rescuer, or the victim himself, if alone, should quickly tie a stocking, handkerchief, or other cloth loosely above the wound, place a pencil or stick under it, and twist it tight enough to shut off circulation (Fig. 165). Then he should suck the wound, spitting out all saliva while so doing. After 5 minutes the bandage should be loosened for a few seconds to admit new blood to the limb (otherwise gangrene may result); then repeat until it is evident that severe poisoning will not occur. The victim should be put to bed and kept quiet until the doctor arrives. The traditional method of giving alcohol for snake bite is strongly opposed by modern physicians. It is not conceivable that it ever saved a life. Those who survived were some of the nine who would recover anyway. If antivenom serum is available it should be used at once (see page 184). Above all one should not become panic-stricken and use a tourniquet too long or too tightly applied, as lasting injury may result (page 436).

[1] Editorial in *Journal of the American Medical Association*, Feb. 2, 1935.

Dog Bites.—If a healthy pet merely nicks a child's hand in play the wound should be treated like any other small wound with iodine and bandage.

If a dog or other animal has intentionally bitten a child or adult, have the animal confined, but treated kindly until it can be determined whether it shows any sign of hydrophobia. A speedier method is to kill the dog, cut off the head, pack it in ice, and send to the nearest laboratory for examination of the brain for the presence of rabic virus. Meanwhile the child should be given the benefit of any doubt. The wound should be swabbed quickly and thoroughly to the very bottom with iodine or other antiseptic and the child taken to a doctor as soon as possible in order that he may receive antirabic serum (see page 185).

All dogs should be kept actively immunized against rabies. Many communities have ordinances requiring this.

CHAPTER XLIII

LOSS OF CONSCIOUSNESS

In any case of sudden illness involving loss of consciousness the first thing to be done is to note the action of the patient's heart and to avoid putting any extra strain upon this organ through misguided efforts to get him to a bed. It is usually much better to allow him to remain quietly where he has fallen until some measure of first aid can be given; often it is better that the doctor should see him before he is moved.

Fainting.—Fainting is caused by the sudden lessening of the blood supply to the brain. This may be caused by severe hemorrhage, by pain, by fatigue, or by physical or mental shock, such as a hard fall or bad news. Some persons of unstable physical make-up faint easily when fatigued or excited.

The only thing to be done is to place the fainting person flat upon the back with head low, loosen the clothing about the neck and chest if necessary, give an abundance of fresh air, and keep panicky relatives and bystanders out of the way. As soon as the patient is able to swallow, give some stimulant in the form of a hot drink, such as black coffee or aromatic spirits of ammonia and water.

Fainting is a protective procedure on the part of nature to save the vital forces under shock. A true faint is never fatal. The pulse is regular though often weak. One should, of course, make certain that the condition is not a collapse or coma or loss of consciousness from some more serious cause. If there is a bluish mottling of the skin, noisy or labored breathing, or convulsive movements, or if the unconsciousness is prolonged beyond a few minutes, a doctor should be summoned.

Hysteria.—Hysteria or "hysterics" is the name given to nervous seizures which occur in some neurotic high-strung individuals who have poor self-control and occasionally in well-balanced persons under great strain (see page 270). It has many different

manifestations, varying from uncontrollable laughter to "fits" or convulsions which closely resemble true epilepsy.

A hysterical seizure may be distinguished from epilepsy by the fact that the patient does not bite his tongue, does not fall in such a way as to hurt himself, and is not really unconscious. This last may be tested by trying to lift the eyelid. In true hysteria the victim will usually resist by forcibly keeping the eye closed.

Treatment.—Oversolicitude prolongs the attack. The sufferer, having lost his self-control, must have this supplemented by firmness on the part of others. Everything should be quiet and everyone kept out of the room except the nurse and doctor. A firm command will often bring the patient out of the seizure. Usually the patient will come out of it quite promptly if the room is kept absolutely quiet and he thinks he is alone.

It must not be forgotten that hysteria is a disorder which is as yet not fully understood, and above all the person suffering from it should not be blamed or held up to ridicule. There may be a connection between hysteria and hypoadrenalism (see page 137).

Prevention.—Building up the general health, an abundance of sleep, together with plenty of wholesome, normal activity and interests, will usually prevent the return of this trouble.

Epilepsy ("fits") is one of the diseases which thus far baffle medical science. It is an explosion of nervous energy in the cortex of the brain, which may throw the entire body into spasmodic action, or it may cause only a momentary loss of consciousness.

The epileptic patient usually has an aura or warning that a seizure is coming. Sometimes he has time to sit or lie down or seek a place of safety. Often, however, he falls suddenly and may strike the ground or floor with terrific force. Epileptic women have been known to fall across the stove while cooking. The true epileptic in a violent seizure froths at the mouth, bites his tongue, becomes purple in the face, and twitches and jerks violently. After the seizure subsides the patient may urinate involuntarily with the sudden relaxing of his muscles. He usually sinks into a sound sleep and may awaken with little or no recollection of the occurrence.

Treatment.—There is nothing to be done during a seizure except to loosen neckbands and other restraining clothing, place a roll

of cloth or piece of wood such as a lead pencil between the teeth to prevent the chewing of the tongue, give fresh air, and protect the patient from striking against hard objects. Keep away the crowd and wait quietly for him to waken.

Apoplexy or "stroke" is caused by pressure on the brain of blood which has escaped from small broken blood vessels. The symptoms are unconsciousness, noisy breathing, dilated pupils, slow strong pulse with loss of sensation and motion on one or both sides, incoherent thought and speech on the recovery of consciousness.

Treatment consists in summoning a physician, loosening clothing, and keeping the body quiet. The effort should be to avoid everything which can cause more blood to leak into the brain tissues. The head should be raised rather high and kept cool. The head should be moved very gently. No stimulants should be given.

Heat Prostration.—One who is very tired or whose health is not up to par may be "overcome by heat" and simply give out and show the usual signs of shock—sudden prostration, cold, clammy, pale skin, and weak pulse. The temperature is apt to be lower than normal.

The treatment is the same as for any kind of shock. Put to bed, apply heat to feet, and rub the body with bare hands, dry bath towel, or warm alcohol. Give strong hot coffee or any other stimulant available. If the patient does not begin to revive promptly, send for the doctor, as there may be a factor of heart failure in the case.

Heat Stroke.—In a heat stroke the body becomes so hot that the heat-regulating machinery can no longer keep the body temperature "normal," *viz.*, at 98.6°F. (see page 113). The face flushes, and the subject falls and may become unconscious. His skin feels dry and very hot. He usually has stopped sweating some time before, always a dangerous thing in hot weather. His temperature will be found to be very high, rapidly approaching the temperature of the surrounding air, which may be 110° or more (Fig. 173). One cause of heat stroke may be the leaking away of body salt in perspiration. Extra salt should be taken by everyone in hot weather when perspiring freely.

The treatment consists in reducing the heat of the body as rapidly as possible. Wrap in cold wet sheets, pack the head in ice, carry to the coolest possible place, and send for the doctor. Notice that this condition is very different from heat prostration and requires different treatment.

Suffocation.—For smothering from hanging, smothering from bedding, being buried in fallen earth, or other forcible exclusion

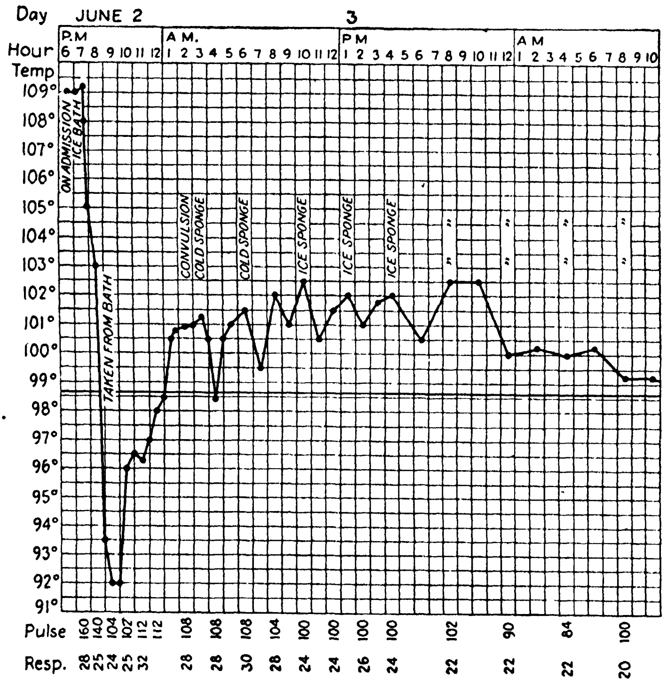


FIG. 173.—Temperature curve in a case of sunstroke treated by ice baths with recovery. (*Osler, Principles and Practice of Medicine, D. Appleton-Century Company.*)

of air from the lungs: remove all obstruction to breathing, loosen clothing, place in fresh air, and give artificial respiration (see page 459).

For smothering from inhaling of illuminating gas or of carbon monoxide in closed garage, open the door and windows wide. Remove victim to absolutely fresh air and give artificial respiration.

For smothering from inhaling "damp" (carbon monoxide) in wells, mines, or other stagnant places: rescue with grappling hooks if possible unless a gas mask is available for the rescuer to wear. If necessary to carry the victim out without these aids, the rescuer should take a deep breath of fresh air and make all speed. After rescue proceed with artificial respiration.

Drowning.—First turn patient on his face and lift by grasping around his abdomen while standing astride his back. This will let the water run out of his throat. Be sure that the throat is free from sand, seaweed, or other foreign substances. Then stretch

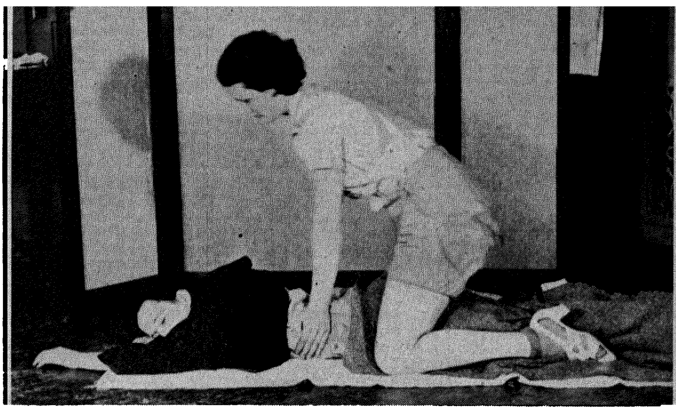


FIG. 174.—Giving artificial respiration—Schaefer method. (Note that the body is covered with wraps.)

him out on the ground, still on his face, and use artificial respiration. As soon as breathing returns get him to a warm bed as quickly as possible and use heat and stimulants. If necessary to move the patient some distance, rub all over with the hands, cover with dry clothes, and keep him as warm as possible while on the way. Cover the body warmly while performing artificial respiration, as it is highly important to conserve every bit of body heat. Friction of the extremities may be employed by a second rescuer.

Artificial Respiration (Schaefer method).—Free the clothing about the neck and chest, turn the patient on his face on the ground or floor with face to one side, mouth open, and forehead resting on flexed forearm. Kneel and straddle his hips and

spread the palms of both hands so that the thumb sides of the palms will almost meet at the lower edge of the ribs. Straighten the elbows and bring the weight of the body upon the hands. The movement should be an upward shove, or squeeze, rather than a hard impact. Push while counting "one, two" very deliberately, then straighten up and count one, two at the same rate. Then throw your weight on your hands again and keep this up with a steady, slow rhythm. This should be done at about the rate of normal breathing, about 16 times per minute or once every 4 seconds. It is good practice to count with the clock ticking until one can count at about that rate any time it is necessary.

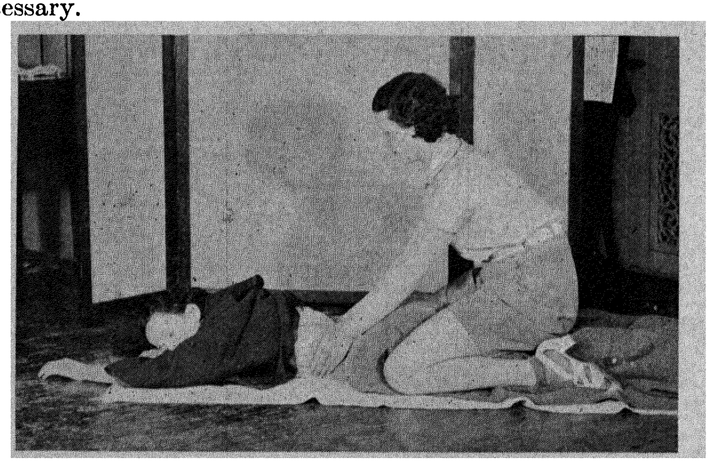


Fig. 175.—The second movement in artificial respiration.

This pushing up against the ribs forces air out of the lungs, and when the pressure is released fresh air rushes into the empty lung cells. The treatment must be persisted in for one to several hours, as many cases are reported in which breathing has been established after hours of artificial respiration. The work should be done quietly and deliberately. An excited person usually does the movements too rapidly to permit the air cells to empty and fill. The patient should always be warmly covered and, if other help is at hand, heat and friction may be applied to the feet while the artificial respiration is in progress. After breathing returns the patient should be carefully put to bed and treated with heat and stimulants (Figs. 174 and 175).

*

CHAPTER XLIV

MISCELLANEOUS EMERGENCIES AND MINOR ILLNESS

Indefinite Illness in Children.—When a child droops, stops playing, appears heavy-eyed, perhaps a little feverish, does not care to eat, but does not complain of any particular ache or pain, it is impossible for anyone to say positively what is "working on the child." He may have an indigestion, or a cold, or he may be coming down with some serious illness.

There are certain things which should be done in any and every case without waiting to see what will develop.

1. Look at his throat; see if his ears are tender; if his abdomen is bloated or tender; take his temperature and write it down.
2. If there is no local tenderness in the abdomen, he may be given a soapsuds or salt-water enema to wash out the bowel. If the fecal matter does not have a normal color or odor or seems constipated, give a dose of milk of magnesia or other mild laxative.
3. Give a warm bath and put to bed.
4. Keep other children out of the room.
5. Give water to drink freely and often, but do not offer food unless the child seems hungry, in which case give a little gruel or milk or fruit juice.
6. If the throat appears red, have child gargle every hour with warm salt water (1 teaspoonful to 1 pint of boiled water). Wrap the throat in a cold wet compress covered with a dry towel (Fig. 176). If there are white patches on the throat, or if the ears hurt or the glands under the chin are enlarged and tender, or if there is elevation of temperature, report to the doctor at once.

Sudden Illness.—*Convulsions in children* are occasionally caused by indigestion with constipation or diarrhea, brought on by improper eating, but usually convulsions are caused by the same conditions which produce a chill in an adult at the beginning (prodrome) of fever and infections. The convulsion in this case is always followed by fever. The temperature may go very high. A child coming down with a contagion may have several convulsions. When later symptoms of the disease occur, such as breaking out, the temperature usually falls and the

convulsions cease. Convulsions also occur in some kinds of poisoning, especially with strychnia. They occur in certain illnesses, such as tetanus (lockjaw; see page 433), tetany (see page 131), and some kinds of meningitis. A child on going into a convulsion becomes stiff and rigid and may show congested face and spasmodic movements.

Treatment.—It is always in order to send for a doctor in haste. In the meantime undress the child if the clothing can be easily removed; otherwise let clothing remain and quickly place him in a warm bath. Do not have the water too hot. Test with elbow or thermometer and do not forget to keep the head cool

Fig. 176.—Applying a cold wet compress to the throat.

by wrapping in a cold wet towel. Take the child out as soon as he is relaxed, remove any clothing, pat dry with a towel, and wrap in warm, dry sheet or blanket. Do not put on even a nightdress until the patient is fully recovered and rested. As soon as child is taken from the bath give a copious soapsuds enema. Give very gently and without excitement, using a bedpan, but be sure that the bowel is well cleansed. If the first results are doubtful, repeat the enema in 30 minutes to 1 hour.

Cautions.—Convulsions are terrifying but fortunately are seldom fatal. The mother should compel herself to be calm and go about the above program in an orderly and efficient manner. Every mother should have rehearsed this in her mind many times: "I must not burn the baby. I must keep its head cool, and I must wash out the bowel." Some books advise adding mustard

to the bath. This is painful later and entirely unnecessary, and should never be used on the tender skin of a young child.

Cramps or Colic.—In children a sudden and violent pain in the abdomen means acute indigestion, poisoning, or acute appendicitis.

A hasty investigation will usually give the mother a hint as to whether the child has eaten some unsuitable food or whether he has been poisoned. If the trouble is acute appendicitis he is apt to draw up his right leg and have a great terror of having the right side of the abdomen touched. He has usually shown some tenderness in this spot and has not seemed well for a day or two before. If it is either of the first two reasons, the pain is apt to be higher up in the region of the stomach or about the navel. The pain of appendicitis is usually localized in the lower right-hand corner of the abdomen, although it occasionally is felt most acutely elsewhere. If there is any possibility of appendicitis the individual should be put to bed and remain very quiet until seen, as soon as possible, by the doctor. Nothing, not even a drink of water, should be taken by mouth, and cold instead of heat should be applied to the seat of pain. No cathartic is to be given. The bowel must be kept quiet.

If the trouble is acute indigestion or poisoning, the mother should cause the child to vomit. This is most effectively done by compelling him to drink lukewarm water until vomiting ensues. If not then relieved, he should be made to repeat the performance until the water comes back clear and the mother feels quite sure the stomach is entirely empty. This is just as effective as a stomach pump, much simpler and less expensive, and does not frighten the child (see page 469). Soap or oil or salt may be added to the water if a pint of plain water does not start the vomiting. The soft palate may be tickled with the finger after the child has drunk all the water he will drink, having care not to injure the delicate tissue.

With an infant, syrup of ipecac may be given in half-teaspoonful doses in plenty of warm water to induce vomiting. The warm water alone is best, however, if it is possible to make the child drink it. As soon as the vomiting ceases an enema should be given to cleanse the lower bowel, and as soon as the stomach will retain anything a mild saline laxative should be given. Hot wet

compresses applied to the abdomen over the region of pain will help to relax the muscular spasm. Dry artificial heat of any kind may be used, such as a hot-water bag, a sack of hot salt or sand, or a laundry iron.

Colic in adults has much the same significance as in children and calls for the same treatment. An adult can usually induce vomiting himself by tickling the back of his throat with his finger after drinking warm water. If in desperate pain, he may add mustard or oil or something nauseating to the warm water to start the vomiting. The adult should empty the bowel with an enema and take a cathartic as soon as possible.

Vomiting.—When a child (or adult) becomes suddenly ill and vomits, note carefully the vomited material. If it is undigested food, it probably means that he has eaten something which he should not have eaten, and he will then be relieved as soon as the stomach is thoroughly emptied.

If one has been poisoned by food or has accidentally swallowed poison, there will probably be violent pain, and there may be purging or running off at the bowels at the same time (see page 242). In any case thorough emptying of the stomach is the first thing; warm water should be forced down even though one is nauseated, and no attempt should be made to stop the vomiting until the warm water comes back clear. If the vomiting does not then stop, that means the muscles cannot stop contracting and their action has become spasmodic, or it means that there is still something poisonous in the system. A doctor should be called, as this may be the beginning of a serious illness. Holding ice in the mouth, cold wet cloths to the throat, and a mustard poultice or heat over the stomach may help to stop spasmodic vomiting or retching on an empty stomach.

Croup.—There are two kinds of croup, spasmodic and membranous. In *spasmodic croup* the child goes to bed apparently as well as usual, or he may have had a slight cold or a mild digestive disturbance. The attack comes on suddenly and violently. He wakes up with a shrill, whooping cough and struggles for breath. This is terrifying but not dangerous. The mother should be calm and assure herself that the child is not going to choke to death. If hot water is not at hand, a cold wet compress can be applied immediately to the throat and will usually relax

the spasm (Fig. 176). Water should be heated at once, however, for use if needed. A small bath towel may then be wrung out of hot water and applied to the child's throat. The child may sip water as hot as he will take it. A little salt may be added to the water. Keep him warmly covered. If this does not relax the spasm within a few minutes, the child must be made to vomit the mucous secretion which is causing the distress. Drinking more warm water to which butter, oil, or grease of any kind has been added, or tickling the palate, will usually be effective.

Inhaling steam will also give relief (see page 387). Do not continue steaming for more than 10 to 20 minutes. Some care is necessary to prevent smothering the child in steam. When children are subject to croup it is well to keep a couple of ounces of syrup of ipecac on hand. A half to one teaspoonful will cause the child to vomit the sticky secretion and so relieve the choking.

After the attack is over the child will be very much relaxed, tired out, and sweating, and will take cold easily. He should be well rubbed all over with a rough towel, and have warm, dry clothing and bedding, but he should not be kept so warm that he will continue to sweat.

Membranous croup is one form of diphtheria (see page 210). The child chokes and struggles for breath because he is being strangled by the membrane which is growing in his breathing passages. If he is not relieved death ensues in a short time. Membranous croup may come on gradually. The child droops and appears out of health, has some temperature, has a hoarse, "brassy" cough, and it gradually becomes more difficult for him to breathe. It becomes so difficult finally that he begins to struggle for breath and gets blue in the face. This stage may be reached in 24 to 48 hours from the beginning of the trouble. The mother should watch sharply for this type of illness and get medical attention (which means diphtheria antitoxin) in time to avoid this terrible crisis.

Every mother should remember that children seldom complain of sore throat, and she should make it a rule to examine her child's throat in any case when he seems at all out of health, and should have a physician see any throat showing "patches" on the tonsils.

Hiccough is caused by a spasmodic, involuntary contraction of the diaphragm and epiglottis which produces a characteristic clicking vocal sound. Usually the seizure lasts only a few moments and ceases without treatment. Occasionally the contractions are persistent, violent, and exhausting. The cause is not known. Treatment consists in trying to arrest the contraction of the diaphragm by slapping the victim suddenly upon the back; startling him by a loud noise; drinking in water; holding the breath, etc. If the hiccough is persistent a physician should be called.

Strangulated Hernia.—A person having a rupture or hernia may, through sudden exertion, force a loop of the bowel through the umbilical or the inguinal opening, and it may be very difficult to replace it in the abdomen. The sufferer should lie down at once with hips higher than the head or with the knees drawn up or take the knee-chest position (page 160). If this is not successful he should then relax completely and try to work the loop of the bowel gently through the opening. The person having the rupture can do this better than anyone else, as the greatest gentleness must be used to avoid bruising the bowel. If he is still unsuccessful a doctor should be called, since it is very dangerous for the bowel to remain constricted in this way.

Menstrual Pain (see pages 159–161).—Immediate relief from pain may be secured by remaining in bed, keeping the body warm and relaxed, and using heat locally. Taking a copious warm enema will remove all local pressure upon the congested uterus and will tend to increase drainage. Heat may be applied externally. Drinking hot fluids will help. Aspirin or other pain reliefs should be taken only with the physician's knowledge and approval. One should remain quiet after taking such medicines.

Headache may be caused by toxins from improper eating, constipation, loss of sleep, bad air, anemia, or glandular imbalance. Headache may also accompany infection of the sinuses and the early stage of acute infections. It may be caused from eyestrain or by pressure from growths within the skull, or from congestion of the cerebral blood vessels. The appropriate preventive measure will be obvious in each instance—correcting one's health habits and consulting a physician. A particularly intractable variety of headache is the periodical or recurrent

so-called *migraine* or "sick headache." It is now believed that certain headaches are allergic in origin (see page 193) and that relief may be obtained by identifying and avoiding the particular offending protein antigens.

Immediate relief with most types of headache may be obtained in some degree by the application of heat or cold at the back of the neck, by counterirritants at the same point, or by hot foot baths or other measures to withdraw the blood mass from the head. A thorough emptying of the bowel will remove possibly toxic material and also help this diversion of blood. Going to bed in a darkened room will usually hasten results. Everyone taking aspirin or other pain relief should go to bed until the depressing effect of the drug wears off.

Backache, like headache, may have many possible causes. Mechanical strain from a fall, from gymnastics involving twisting or straining, from habitual poor posture, or from bad shoes may cause anything from a dull ache to the extreme and incapacitating pain of a sacroiliac sprain. Treatment consists in going to bed on a flat, hard mattress and lying in a symmetrical and relaxed position. Heat, either dry or moist, will relieve pain and help relax the stretched muscles and ligaments. In extreme cases massage and mechanical adjustments made by a skilled professional operator may be necessary. When the sacroiliac ligaments are weak, strapping or other support may be called for.

Backache of varying degrees of severity and duration accompanies many systemic infections. A possible but very infrequent cause (contrary to lay belief) is derangement of the kidneys. A prolonged or recurrent pain or soreness of the back should be referred to a physician and never "dosed" on lay responsibility.

A persistent pain between the shoulders should be referred to a physician. It may be caused by irritation of the intercostal nerves from foci of infection in tonsils or teeth, or it may accompany organic disturbance in the lungs or other structures in the chest.

Poison ivy, poison oak, and swamp sumac (Fig. 177) all produce a heavy irritant oil to which many persons are highly susceptible (page 196). Scrubbing immediately and thoroughly with soapsuds, using fresh solution every few minutes, to remove the volatile, excoriating oil is the best treatment. Later, bathing

with dilute alcohol with application of compresses kept soaked in dilute alcohol, a solution of magnesium sulphate, epsom salts, or potassium permanganate will allay pain.

Poisons and Poisoning. *Prevention of Poisoning.*—Poisons should not be kept in the house unless actually necessary. Any poisonous substance remaining after the occasion of its use should be destroyed. Rat poisons, cockroach powders, and similar preparations should be used with great care to protect children and pets.

FIG. 177.—*A*, poison ivy; *B*, poison oak.

Corrosive or poisonous antiseptics, such as carbolic acid or bichloride of mercury, should be made up in dilute solution ready to use and not kept in concentrated form. Muriatic acid, sulphuric acid, lye, and other corrosive cleaning materials should not be kept in the house.

If strychnine or other poisonous tablets are kept on hand during an illness, they should be kept in a special bottle marked "poison," and have a pin run through the cork to notify one of danger, even in the dark.

It is a good idea to post a list of common poisons with treatment on the inside of the medicine cabinet door. Children

should be taught to recognize the common acids and alkalies and learn, while very young, that each counteracts the other.

General Procedure in Suspected Poisoning

1. Send for a doctor at once.
2. Determine whether the poison was a corrosive, acid, alkali, depressant, stimulant, or general, and act accordingly. Discover, if possible, how much poison has been taken and when.
3. One or more of the following treatments will be indicated?

a. EMETICS (to produce vomiting).—The best and safest emetic is lukewarm water taken in copious amounts. This washes out the stomach as effectively as a stomach pump and produces easy vomiting with the least possible amount of strain. Large quantities must be forced down. Grease, mustard, or salt may be added to make the water nauseating. This is not necessary if the patient will drink enough plain water. An individual may provoke vomiting in himself by tickling the soft palate with his finger. The stomach should first be filled with water.

Sirup of ipecac in teaspoonful doses is a safe and effective emetic. It must be remembered that vomiting on a comparatively empty stomach is very prostrating and minute quantities of poison cannot be gotten rid of unless copious quantities of water (quarts if need be) are swallowed.

b. DEMULCENTS (to soothe irritated surfaces).—White of egg, milk, starch water, oils, and fats.

c. STIMULANTS.—Hot, black coffee, aromatic spirits of ammonia (teaspoonful in one-third glass water, which may be repeated), rubbing, heat; if breathing stops, artificial respiration may be tried.

d. ANTIDOTES.—Certain poisons have specific antidotes, chief among which are:

Carbolic acid—antidote, alcohol (dilute if swallowed).
Alkalies—antidote, acids.
Acids—antidote, alkalies.
Arsenic—antidote, dialyzed iron, tincture of iron.

Among the common poisons may be mentioned the following:

ARSENIC (found in Paris green, rat poisons, etc.).—Treatment, in order given, emetics, demulcents, stimulants.

ACIDS (muriatic, sulphuric, oxalic, nitric, etc.).—Treatment, in order given, alkalies, such as soda, magnesia, lime, borax, boric acid, or soapsuds. Follow with demulcents, then stimulants.

ALKALIES (lye, potash, caustic potash, caustic soda, etc.).—Treatment, in order given, acids, such as dilute vinegar or lemon juice; demulcents; stimulants.

CARBOLIC ACID.—The antidote is alcohol. Give alcohol and water or anything containing alcohol, or alkalies as listed for treatment of acids; then demulcents, milk, eggs.

CORROSIVE SUBLIMATE (bichloride of mercury, bedbug poison).—Emetics if throat is not too badly injured; demulcents.

OPIUM (paregoric, laudanum, morphine, codeine, heroin).—Stimulants; keep up respiration; keep awake.

PHOSPHORUS (match ends, rat paste, etc.).—Emetic, do not give fats or oils. Give other demulcents, then stimulants.

STRYCHNIA (nux vomica).—Emetic if any remains in stomach. Absolute quiet, may need opiates.

VEGETABLE POISONS (such as toadstools, poisonous mushrooms, bittersweet, wild lettuce, wild parsley, rhubarb leaves, hellebore, mountain ash, etc.).—Give emetics, stimulants, rest.

FOOD POISON and BOTULISM.—See pages 241–243.

CHAPTER XLV

BANDAGING AND EMERGENCY TRANSPORTATION

Bandages.—*Homemade bandages* may be made from old sheets, provided these are not too badly worn. The less worn portions of the sheet near the edges should be used for the wider bandages in which greater strength is ordinarily required. Three or four strips ¾ inches wide may be torn the length of the sheet and wound separately for finger bandages. A dozen strips exactly 2 inches wide will make a half-dozen bandages of the proper width for injuries to the arm, foot, or wrist. There may be two or three bandages 3 inches wide for injuries to shoulder, knee, or thigh. To splice these strips, lap the ends flat for a square space and baste around the four sides of the lap (Fig. 178). Two of the 2-inch strips make a convenient length, while three of the 3-inch strips may be joined for the heavier bandage.

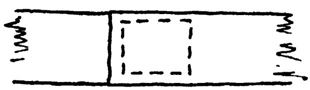


FIG. 178.—To splice a bandage.

Bandages should never be made from new material unless it has been shrunken; otherwise they may shrink after being applied and become too tight. The selvage should always be torn from any material used for this purpose.

To wind the bandage fold the end back and forth for an inch or two to get a start, then wind round and round, pulling on it all the time so as to make a firm, hard roll (Fig. 179). Wrap the rolls in tissue paper or cellophane, bake for an hour at a low heat, and place them in the home medicine closet.

Commercial bandages may be purchased in all widths and lengths and in many materials, as paper, gauze, muslin, flannel. or buckram. For first aid in the home two or three each of the ¾-inch, 2-inch, and 3-inch gauze bandages will represent a fair assortment.

To Apply a Bandage. 1. *The Spiral.*—To apply a bandage to the arm, face the patient, grasp the bandage in the right hand,

lay the bandage against the wrist and unroll it from left to right, making two or three turns flat around the wrist so that the

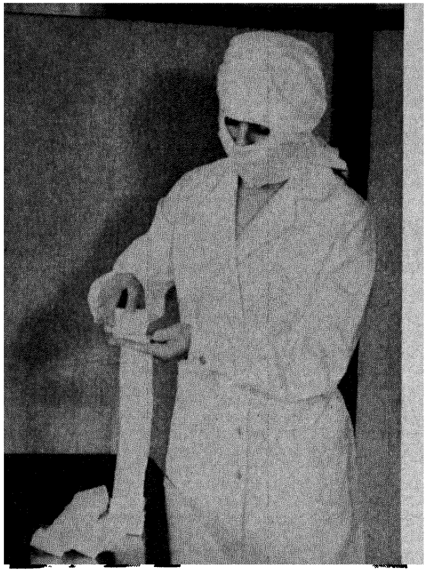


FIG. 179.—A quickly improvised surgeon's mask. How to roll a bandage.

FIG. 180.—To apply a spiral bandage.

bandage is firmly locked; then proceed to go up the arm, leaving exactly one-third of the width of the bandage uncovered at each

turn. Never lift the bandage from the arm in making a simple spiral. Just unroll it smoothly, evenly, and firmly (Fig. 180).

2. *The Reverse.*—When the lower edge of the spiral bandage begins to be loose and the spiral will not fit over the tapering

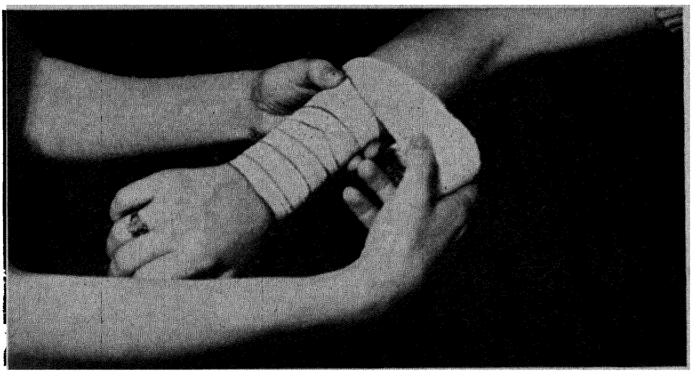


Fig. 181.—To reverse the bandage.

shape of the arm, the bandage must be reversed. This is done by turning over the bandage every time it comes on top of the arm, still taking care to leave uncovered exactly one-third at

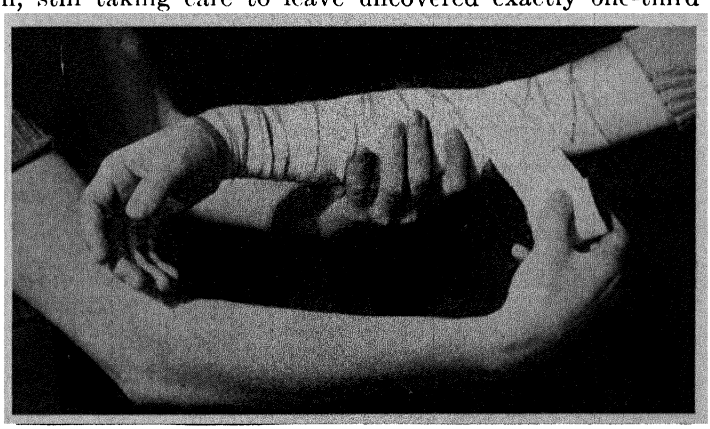


Fig. 182.—The figure-of-eight.

each turn. The thumb of the left hand holds the bandage already applied while the bandage roll in the right hand is turned over. The bandage must be loosened in making the reverse to prevent

wrinkling. The bandage should be everywhere three thicknesses deep (Fig. 181).

3. *The Figure-of-eight.*—When the elbow is reached it is necessary to go alternately above and below the elbow in what is

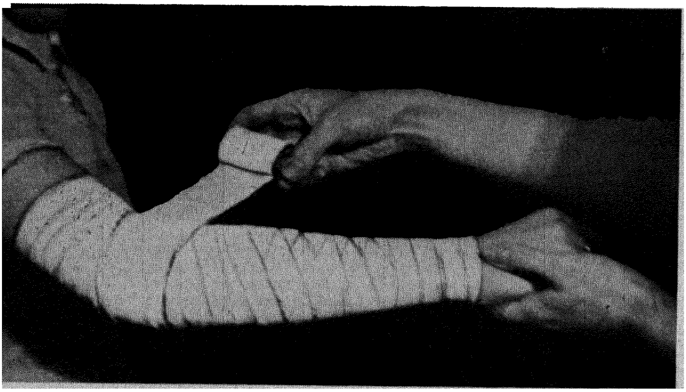


FIG. 183.—The last turn should come over elbow.

known as a "figure-of-eight," with the crossing on the front of the elbow leaving the elbow tip free in a hingelike arrangement.

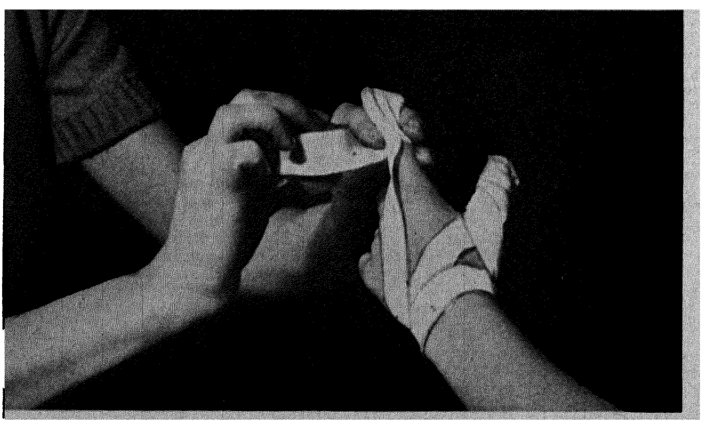


FIG. 184.—Finger: cover the end of the finger with two loops at right angles to each other.

The "hinge" should start at equal distances above and below the joint, approaching the elbow with each crossing over and bringing the last turn over the tip. It is necessary to go around

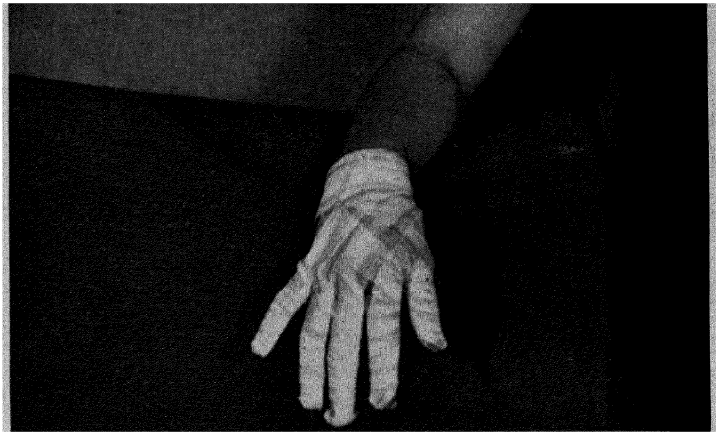


FIG. 185.—The completed gauntlet bandage.

FIG. 186.—A four-tailed bandage to the chin. A triangular bandage used as a sling.

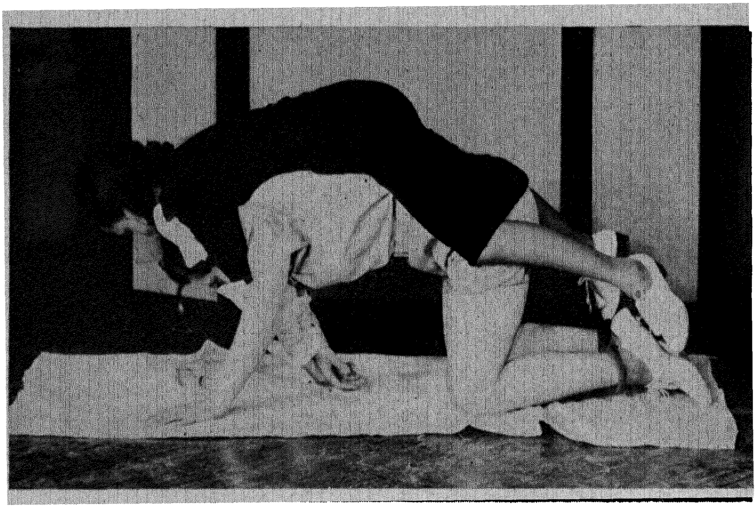


FIG. 187.—The crawl carry.

FIG. 188.—The one-man lift—first position.

FIG. 189.—The one-man lift.

the arm between the crossings in order to keep the bandage from slipping off the elbow (Figs. 182 and 183).

These three procedures are the fundamental bandaging movements. With these, or modifications of these, any part of the body can be bandaged.

The Tension of the Bandage.—The bandage should be neither

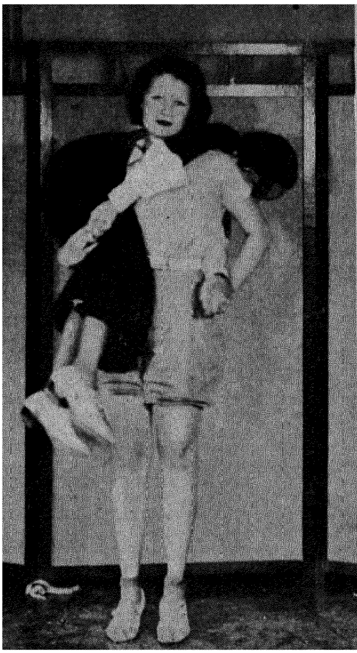


FIG. 190.—The right-shoulder carry. Start with person on knee.

FIG. 191.—The back carry, with the patient's hands tied.

over. A bandage must never be tight enough to impede the circulation. The beginner should test the tension of the bandage by gripping it from one end to the other with the palm of the hand.

To fasten a bandage fold in a point at the end and hold in place with a bit of adhesive, a common pin, or a safety pin. If a common pin is used, the point of the pin should be buried under the bandage. An emergency bandage may be torn down the end and tied about the limb.

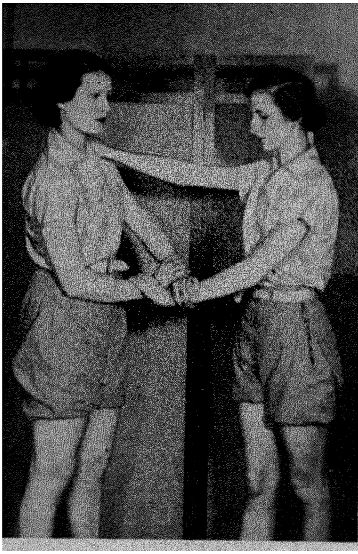


FIG. 192.—A two-man carry with support for back.

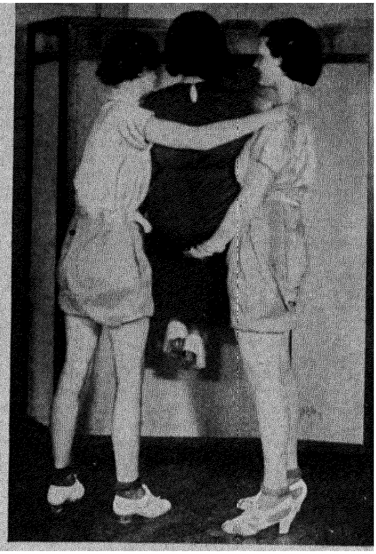


FIG. 193.—A two-man carry with support for back.

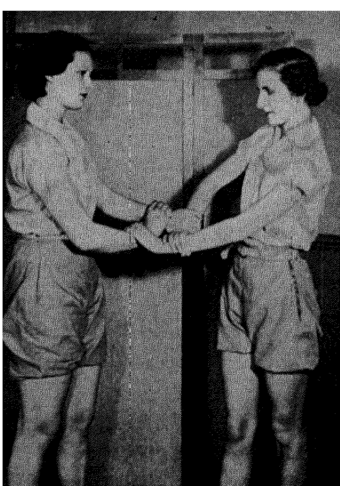


FIG. 194.—The saddle.

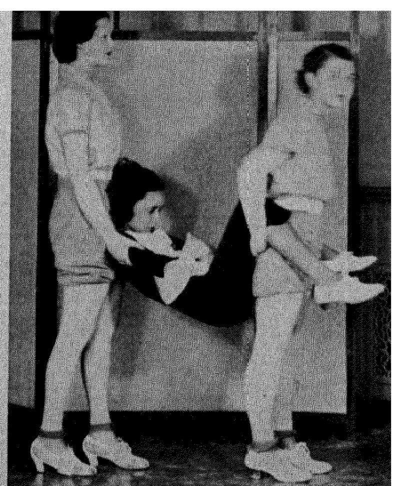


FIG. 195.—The shoulder-leg carry.

To apply a bandage to the hand use a $\frac{3}{4}$-inch bandage; lock it by taking several turns about the wrist. Then carry the bandage over the back of the hand to the tip of the first finger to be band-

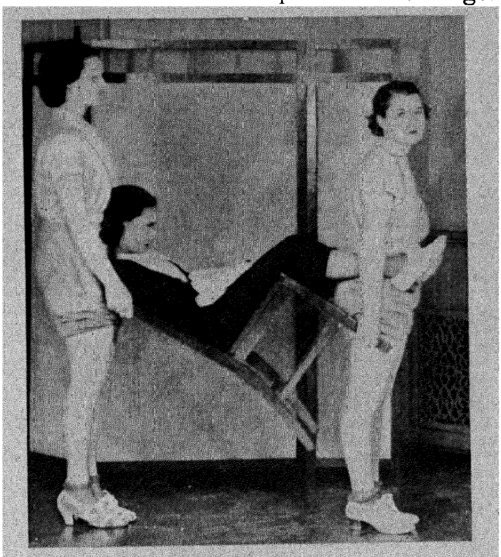


FIG. 196.—The chair carry.

aged (Fig. 184) and cover the end with two loops at right angles to each other and extending below the first joint. Hold these firmly with the fingers of the left hand. With the right hand

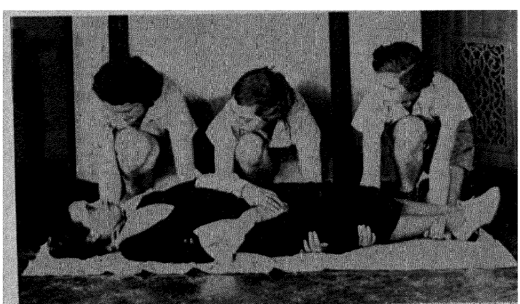


FIG. 197.—The three-man carry—first position.

unroll the bandage from left to right starting near the end of the finger and cover the finger with a spiral, leaving one-third of the bandage uncovered at each turn. At the base of the finger the

downward pass of the bandage should cross the upward pass in a figure-of-eight. The bandage is carried once about the wrist

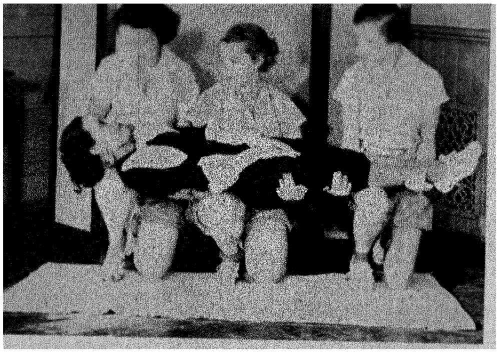


FIG. 198.—The three-man carry—second position.

and then to the next finger. When completed the back of the hand should be covered neatly with crosses while the palm is bare (Fig. 185). If necessary to cover the palm make a figure-of-eight

FIG. 199.—The three-man carry—third position.

about the wrist and the base of each finger, finishing with a about the hand.

Handkerchief or triangular bandages may be applied to various parts of the body. Figure 186 shows the application of a triangle to support the arm. "Many-tailed" bandages are made from squares or rectangles of cloth torn in strips at the edges only. The solid portion covers the dressing, the tails are pinned together to hold it in place (Fig. 186).

TRANSPORTATION

One-man Carries.—Lifting and carrying an injured or unconscious person may present a baffling problem to rescuers who do not have orderly action patterns ready for use. When there is but a single rescuer he will have to make full use of muscle-bone-

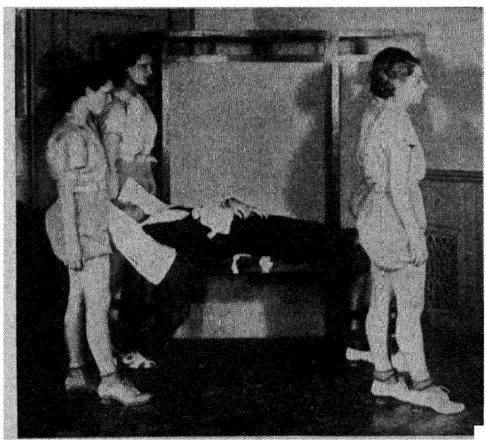


FIG. 200.—The four-man carry. A two-chair stretcher.

leverage and at the same time protect his own back by "tensing" the lumbosacral region (see page 290). One should strive for a feeling of pulling from the big muscles of the shoulders and hips, rather than a lift from the arms.

It is a great help if the victim is conscious and can clasp his hands together about the rescuer's neck. If one must lift an unconscious person, tying the wrists together will help in the management (Figs. 187 and 191).

The arms carry (Figs. 188 and 189) is the simplest for very brief transportation. If one must carry the victim for some distance the shoulder (Fig. 190) or back carry (Fig. 191) is better. The crawl carry (Fig. 187) is to be used in smoke or darkness, or where there is danger of falling.

Two-man Carries (Figs. 192–196).—These are simpler and involve less strain. If a person with broken bones must be transported some kind of a stretcher should be devised. The backs of two chairs may be lapped and tied as in Fig. 200 and may be carried by two or three persons, although four are better. A door, a shutter, a blanket pinned together along the long edges with two poles or boards run through the sides, two coats buttoned or pinned up and used the same way—the resourceful person can find some way of meeting the situation.

The three-man carry as illustrated in Figs. 197–199 is a very efficient method of transportation. The rescuers should count in raising the victim and must keep step.

The four-man carry implies some sort of stretcher; the carriers must keep step and should be approximately of the same height. (Fig. 200). Removing the victim from the stretcher to the bed may be accomplished as in the three-man carry.

References

American Red Cross Text on First Aid, Washington, D.C., 1933.

BLAIR, A. W.: "Spider Poisoning," *Archives of Internal Medicine*, December, 1934.

DOTY, ALVAH H.: *Prompt Aid to the Injured*, D. Appleton-Century Company, 1914.

Editorial on Black Widow Spider, *Journal American Medical Association*, Feb. 2, 1935.

ELIASON, ELDRIDGE L.: *First Aid in Emergency*, J. B. Lippincott Company, 1929.

How to Give Artificial Respiration, United States Public Health Service, 1928.

MITCHNER, PHILIP H.: *Modern Treatment of Burns and Scalds*, William Wood Company, 1935.

Prevention of Disease and Care of the Sick, with First Aid to the Injured, 4th ed., United States Public Health Service, 1930.

STEVENSON, ISABELLA: *Safety Education*, A. S. Barnes Company, 1935.

What to do in Case of Accident, United States Public Health Service, 1928.

WHITNEY, A. D.: *Bandaging*, W. B. Saunders Company, 1935.

WILLIAMS, LEONARD: *Minor Maladies*, 6th ed., William Wood Company, 1933.

APPENDIX

Health History

Name__________ Address__________ Date__________

Date of last physical examination__________ Where__________ By whom__________

Family History.
Father: living, dead. Health: good, average, poor Cause of death or ill health________.
Mother: living, dead. Health: good, average, poor. Cause of death or ill health________
Brothers and sisters: number, health, etc.
Serious diseases in family (relationship): tuberculosis, insanity, mental defect, epilepsy, diabetes, cancer, hay fever, asthma, etc

Personal History. Age____. Height____. Weight____ Optimal weight____. Gained or lost in past year____.
Early health (infancy, early childhood): good, fair, poor—explain__________
Communicable diseases, age and severity.
Other illness.
Injuries and operations.
Complete recovery, explain
Immunizations. smallpox, diphtheria, typhoid, scarlet fever, others.
Ever lose consciousness? Why?

Menstrual History. Age of onset____ Regular yes/no. Length of interval_____. Length of period_____. Pain____. Character, intensity, etc.______ Remedies______.

resent Health General health: good, fair, poor. Explain any tendency to ill health
Tendency to overweight______ Underweight______ Explain______.
Health as compared with a year ago________. Five years ago________.
Elimination: Bowel movement daily yes/no, irreg Cathartic how often______ What remedy________.
Headache: How often_____ Time of day_____ Cause_____. Remedy used_____
Backache: How often_____. Time of day_____. Cause_____. Remedy used_____.
Feet hurt: How often_____. Time of day_____ Cause_____. Remedy used_____.
Eyes: Glasses all the time_____ Reading only_____ Hurt_____. Tire when_____.
Do you pay attention to light and posture when reading_____
Ears: Hearing_____. Infection_____
Nose. Breathe freely_____. Obstruction_____. Discharge (other than acute cold)_____
Tonsils. Normal_____ Diseased_____. Enlarged_____. Out_____.
Teeth: How many missing_____. Replaced_____ Filled_____. Unfilled cavities_____ Pyorrhea, other infection_____
Sinuses: Tender_____. Hurt_____. Infected_____ Discharge_____. Treatment_____.

ervous-mental Health Work congenial__________.
Generally happy, joyous, satisfied with life: all the time, most of time, seldom, never. Explain________.
Subject to worry, fears, blues, discouragement often, seldom, occasionally, never______
Concentration: good, fair, poor.
Control of temper: good, fair, poor.
Nervous, irritable, unstrung, excitable, hysterical. how often, under what circumstances. Explain __________

ealth Habits *Food:* Eat at home, private family, own cooking, sorority, restaurant or cafeteria, boarding house.
Eat breakfast: always, occasionally, never.
Eat between meals: occasionally. often, seldom, never What________
How much daily of following: Coffee_____. Tea_____ Milk____ Coca Cola_____. Cocoa_____. Tobacco_____.
If not daily, how often________
Eat: slowly, moderately, fast_______. Rest before eating_______.
Special likes or cravings_______. Special dislikes_______.
Sleep: Regular bedtime_____. Average hours sleep____ Soundly____ Dream____. Waken or called_____. Get up rested_____.
Baths: How often_____. Kind_____. Morning or evening_____
Teeth: Brush how often_____. With what_____. Dentist how often_____.
Exercise: Any regular other than necessary walking_____. What sports do you know and enjoy_______. How often______.

TIME BUDGET FOR ONE WEEK (168 HOURS)

	Sleep					Care of person		Meals, time spent at table	Out of doors "Necessary locomotion," sports, hiking, riding, etc.	Exercise indoors: dancing, gym, "daily dozen," corrective, etc.	School			Other work		Recreation		Organized activities: church, sorority, clubs, etc.	Rest relax, meditate, do nothing, nap	Miscellaneous: transportation, lost time, etc.	Total, bedtime to bedtime
	Ret. time	Ris. time	Total in bed	Awake	Total sleep	Bath, dress, toilet, beauty parlor, etc.	Care of clothing, mending, pressing, washing, etc., shopping				Class-room	Lab	Prep.	Home or room	For pay	Solitary reading, music, etc.	Dates, games, parties, visiting				
Sun.																					
Mon.																					
Tues.																					
Wed.																					
Thurs																					
Fri.																					
Sat.																					
Total																					

Compute from retiring time Sunday until the same time the following Sunday. The total for the week including total time in bed *or* total time awake and asleep should add to 168 hr.

DAILY HEALTH RECORD

	Rising state: called, awaken spontaneously. Feeling: fresh, rested, vigorous, dull, weary (describe)	Mental state during day, describe: cheerful, happy, joyous, depressed, blue, worried, discouraged, "nervous," irritable, etc.	Illness: painful menstruation, cold, indigestion, etc.	Fatigue: when and to what degree	Pain or specific fatigue, describe time and degree					Posture: conscious of: slumping, effort to correct	Clothing: unpleasantly conscious of any article	Elimination: regular bowel movement, cathartic, what	Miscellaneous
					Feet	Head	Back	Eyes	Other				
Sun.													
Mon.													
Tues.													
Wed.													
Thurs.													
Fri.													
Sat.													
Total													

INDEX OF AUTHORS, PUBLICATIONS AND AGENCIES

SUBJECT INDEX

C